OCTOBER 31, 1958

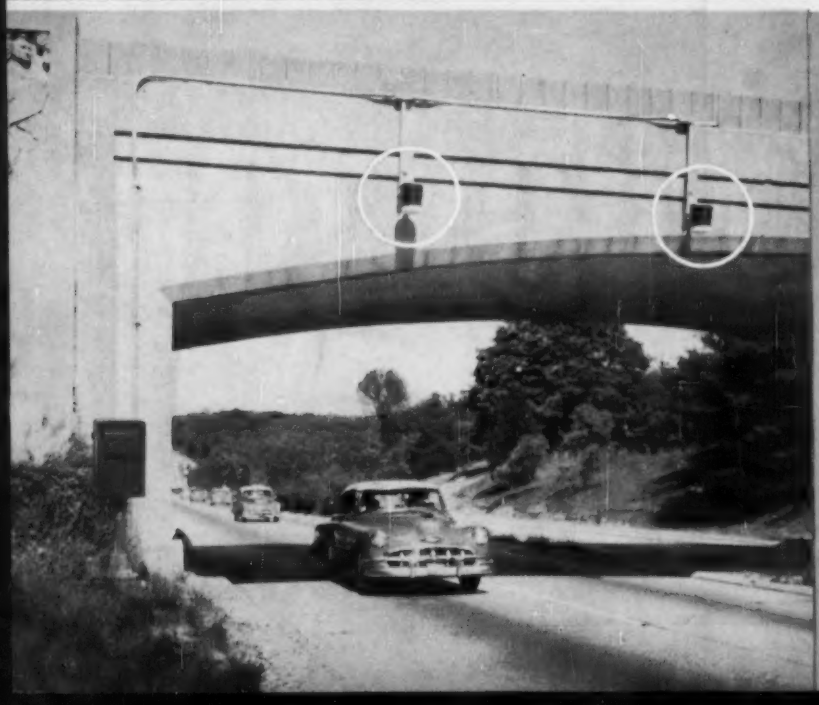
electronics

business issue

A McGRAW-HILL PUBLICATION • VOL. 31, NO. 44 • PRICE FIFTY CENTS

Man Into Space

Electronic gear goes along when Air Force sends balloonist to nearly 100,000 ft. . p 18



Highway Traffic Control

Overhead radar counts

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One BRIDGE TO MEASURE *Any* IMPEDANCE

Ever try to identify an impedance, only to find its value outside the bridge's range? This *can't* happen if you use the General Radio Type 1603-A Z-Y Bridge — it measures *any* impedance, from short circuit to open circuit, real or imaginary, positive or negative, over the complete audio-frequency range.

Proof of the Z-Y Bridge's versatility is demonstrated by its application at The Foxboro Company, manufacturers of "Dynalog" self-balancing recorders, indicators, and controllers. These instruments are used in industrial processing for the measurement of: temperature, pressure, humidity, voltage, flow, weight, thrust, drag, displacement, and many other variables. Many of these applications require "special" Dynalog instruments with modified input characteristics to match specialized transducers — and Foxboro engineers rely on *the* bridge that can measure all these characteristics accurately . . . the G-R Type 1603-A Z-Y Bridge.

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Type 1603-A Z-Y Bridge . . . $370

SPECIFICATIONS:

Impedance and Admittance Range
R: ±1000 ohms G: ±1000 μmhos
X: ±1000 ohms B: ±1000 μmhos

Accuracy
R or G: $\pm[1\% + (2 \text{ ohm or } 2\ \mu\text{mho})]$
X or B: $\pm\left[1\% + \left(\frac{2f_0}{f} \text{ ohms or } \frac{2f}{f_0}\ \mu\text{mho}\right)\right]$
f is operating frequency, f_0 is frequency setting of panel selector switch.
Impedances of less than 100Ω (or 100 μmhos) can be measured on "Initial Balance" dials with considerably greater accuracy —
R or G: $\pm[1\% + (0.2 \text{ ohm or } 0.2\ \mu\text{mho})]$
X or B: $\pm\left[1\% + \left(\frac{0.2f_0}{f} \text{ ohm or } 0.2\frac{f}{f_0}\ \mu\text{mho}\right)\right]$

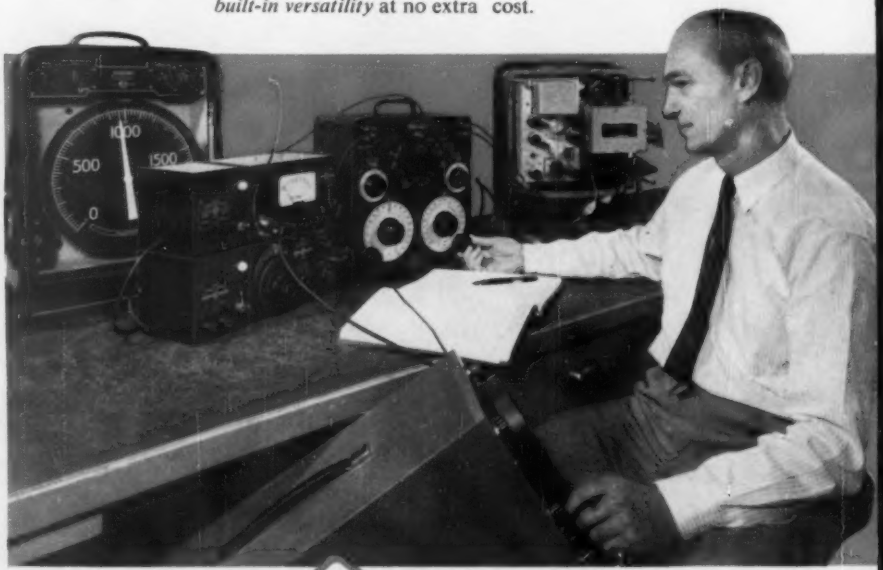
Frequency Range — 20 cycles to 20 kc

Maximum Applied Voltage
130 volts, rms on bridge gives less than 32 v on unknown

Accessories Recommended:
Type 1210-C Unit R-C Oscillator $180
Type 1212-A Unit Null Detector $145

Z-Y Bridge measures impedance characteristics of a "Dynapoise Drive" self-balancing recorder element. A G-R Type 1210-C Unit Oscillator is used as bridge generator, and a G-R Type 1212-A Unit Null Detector indicates bridge balance.

Photo Courtesy The Foxboro Company



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Shoptalk . . .

UNSCRAMBLING TRAFFIC SNARL. Electronic highway traffic control is an infant business which is rapidly growing up. Electronics firms studying traffic control problems say municipalities will spend about $15 million this year for electronic equipment to untangle growing traffic snarls.

In interviews with manufacturers and traffic authorities, Associate Editor Emma examined some of the electronic ways and means for controlling highway traffic.

A few of the techniques discussed are still in the development stage; but others are at work today in cities throughout the U.S. A full rundown on costs and methods of electronic highway traffic control begins on p 15.

AUTOMATION ABROAD. Recently we noted that manufacture and use of industrial electronic equipment, including machine-tool controls, seemed to be increasing overseas. We decided to find out what foreign electronics firms were doing in the machine-tool field and what machine-tool makers were doing in electronics.

ELECTRONICS sent queries to McGraw-Hill World News Bureaus in Britain, West Germany, France and Japan, requesting a look at present and future activities as seen by local businessmen and engineers. In addition, we tapped available sources of information on Russian machine-tool and automatic-control developments.

The information obtained through overseas interviews and chats with engineers returning from abroad has been compounded and boiled down on p 13 by Associate Editor Janis.

BUT WILL IT SELL? One way to stretch scarce engineering talent is to concentrate design and development efforts on products for which there exists a real need and ready market. Market research is gaining recognition today as one good way to find out what products will sell.

With many firms planning their first formal attempt at market research, industry leaders are beginning to come up against the tough questions of how and when, how much, and with whom.

To get some informed opinions on the subject, Associate Editor DeJongh interviewed management and sales executives of electronics firms, marketing research managers, management and marketing consultants. His market-research article appears on p 17.

UP IN A BALLOON. Project Manhigh III, the Air Force's plan to get a man up in space and bring him back alive, depends heavily on electronic equipment. The emphasis is on communications and telemetering gear.

Midwestern Editor Harris went to the launch site and talked with Lt. McClure, jet pilot who rode the balloon to the near 100,000-ft level, and with other engineers and scientists who worked on the electronic communications and instrument packages that went aloft.

Harris' on-the-spot report of the objectives of the near-space project, and the electronic equipment that helped make it possible, appears on p 18.

Coming In Our November 7 Issue . . .

Coming In Our November 7 Issue . . .

● **Wescon Highlights.** The recent Wescon Conference held in Los Angeles was a great success, judging from the attendance and the quality of the papers presented at the technical sessions. In our next issue, Associate Editor Jurgen presents a roundup of some of the interesting and significant developments unveiled at the western conclave.

Two topics which received much attention at the show were the transmission or storage of visual images, and the generation and detection of microwave signals. Jurgen has condensed the meaningful content of five technical papers on these subjects and presents the significant facts in his article.

● **Automatic Pilots.** Increased complexity of automatic flight control equipment coupled with the advent of new high-speed jet transports pose additional problems for the pilot in handling the aircraft. More than ever before, the pilot must rely on automatic control equipment with adequate means of warning in the event of automatic-pilot malfunction.

C. W. McWilliams of the Eclipse-Pioneer Division, Bendix Aviation Corp., discusses the latest devices to be designed into modern automatic pilot systems in the interests of safety. Circuits to prevent dangerous transient maneuvers at the time of autopilot disengagement and to eliminate the stress on aircraft structures beyond safe limits are described.

● **Cosmic Ray Balloons.** During the IGY, changes in intensity and composition of cosmic radiation are being correlated with sunspot activity, solar flares and other phenomena. To measure low-energy cosmic rays effectively, it is necessary to place detectors above the earth's atmosphere.

According to L. E. Peterson, R. L. Howard and J. R. Winckler, of the University of Minnesota, polyethylene balloons are an ideal vehicle for carrying the required equipment. Their article describes the balloon and the instrumentation it carries, which includes recording and telemetering facilities and devices for balloon programming and tracking.

● **Cesium Frequency Standard.** New techniques for the application of the resonance properties of certain atoms such as cesium have resulted in a practical, reproducible primary frequency standard with outstanding long-term stability. The potentials of the Atomichron have not all been realized as yet, but already it is incorporated in the Air Force's Navarho long range-navigation system and is being used as a basic tool in research laboratories.

W. A. Mainberger of the National Company reveals details of the device in his article. Theory of operation, construction details, and auxiliary circuitry are thoroughly discussed.

electronics business issue

A McGRAW-HILL PUBLICATION • VOL. 31, NO. 44 • OCTOBER 31, 1958

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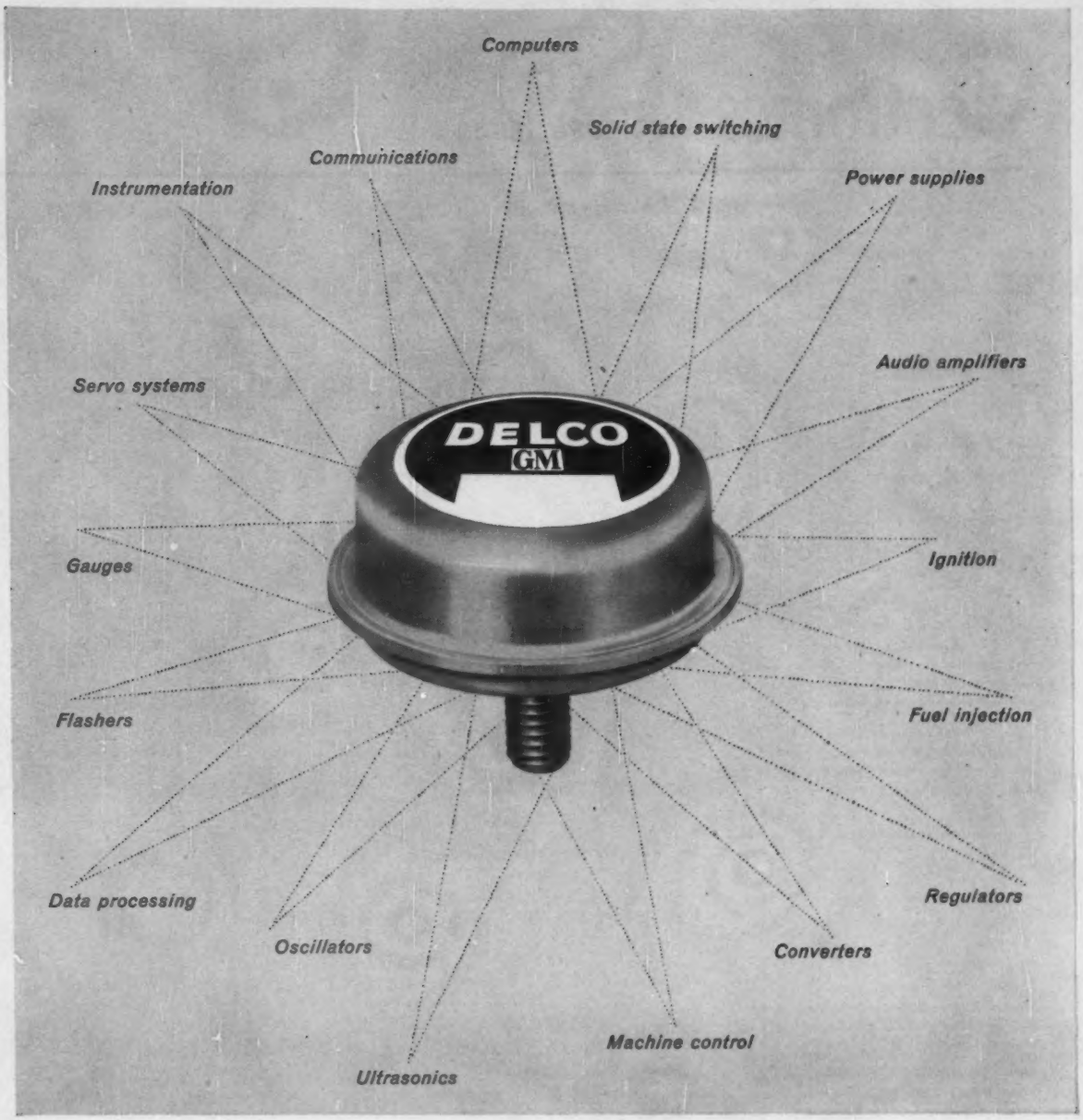

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electronics

Oct. 31, 1958 Vol. 31, No. 44

Published weekly, with alternating engineering and business issues and with a BUYERS' GUIDE issue in mid-June, by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948) Founder.

Executive, Editorial, Circulation and Advertising Offices: McGraw-Hill Building, 330 W. 42 St., New York 36, N. Y. Longacre 4-3000. Publication Office: 99-129 North Broadway, Albany 1, N. Y.

See panel below for directions regarding subscriptions or change of address. Donald C. McGraw, President; Joseph A. Gerardi, Executive Vice President; L. Keith Goodrich, Vice President and Treasurer; John J. Cooke, Secretary; Nelson L. Bond, President, Publications Division; Shelton Fisher, Senior Vice President; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; A. R. Venezian, Vice President and Circulation Coordinator.

Single copies $1.00 for Engineering Issue and 50¢ for Business Issue in United States and possessions, and Canada; $2.00 and $1.00 for all other foreign countries. Buyers' Guide $3.00. Subscription rates—United States and possessions, $6.00 a year; $9.00 for two years; $12.00 for three years. Canada, $10.00 a year; $16.00 for two years; $20.00 for three years. All other countries, $20.00 a year; $30.00 for two years; $40.00 for three years. Second class postage paid at Albany, N. Y. Printed in U.S.A.

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BRANCH OFFICES: 520 North Michigan Avenue, Chicago 11; 68 Post Street, San Francisco 4; McGraw-Hill House, London E. C. 4; 15 Landgrat-Wilhelm, Frankfurt/Main; National Press Bldg., Washington 4, D. C.; Six Penn Center Plaza, Philadelphia 3; 1111 Henry W. Oliver Bldg., Pittsburgh 22; 55 Public Square, Cleveland 33; 856 Penobscot Bldg., Detroit 26; 3615 Olive St., St. Louis 8; 350 Park Square Bldg., Boston 16; 1321 Rhodes-Haverty Bldg., Atlanta 3; 1125 West Sixth St., Los Angeles 17; 1740 Broadway, Denver 2. ELECTRONICS is indexed regularly in The Engineering Index.

Subscriptions: Address correspondence to: Fulfillment Manager, Electronics, 330 W. 42nd St., New York 36, N. Y. Allow one month for change of address, stating old as well as new address. Subscriptions are solicited only from persons engaged in theory, research, design, production, management, maintenance and use of electronics and industrial control components, parts and products. Position and company connection must be indicated on subscription orders.

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This is typical of the advanced work being done by Radiation, Inc. in this field. One project presently underway will produce the most completely automatic universal checkout system in existence.

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Small Firm Pensions

Now business can pay for pension plans out of profits and avoid financial risk of regular fixed charges

PENSION PLANS especially tailored for small electronics and other business firms were in the news last month. An attractive feature: making payments only in years of profit.

Putnam Fund of Boston and R. P. Burroughs, pension consulting firm of Manchester, N. H., are jointly offering a plan for payment of retirement pension systems by allocation of a fixed percentage of annual profits.

Many small firms want to set up pension systems in order to be competitive with large firms in attracting top job applicants but hesitate because of the financial burden of making a fixed payment every year, says G. L. Ludcke, president of Putnam Fund Distributors.

With small company profits varying considerably from year to year, a big annual payment looms as a terrific risk, he says. This is particularly true of small electronics firms, he adds.

Operators of the joint plan claim firms with as few as 25 employees, and with an average annual payment from profits as low as $10,000, can have a plan comparable in quality to those of large companies.

Payments into the profit-based pension system will be tax-deductible from company profits if payments do not exceed 15 percent of total earnings.

Employee taxes on contributions to the pension fund by employers are deferred until time of withdrawal. Since most employees will withdraw in later years of life, when income is usually reduced, the tax rate will be comparatively small.

Under the team method of operation Putnam will invest the monies received in its mutual funds. Burroughs will handle administrative details and maintain records of individual employee interests. The plan will be sold to individual firms throughout the country by hundreds of investment dealers.

Spends $187 Million for R&D

SPENDING for research and development at Westinghouse is currently running at $187 million annually, according to President Mark Cresap.

Of this, $15.5 million is for basic research. Overall R&D outlay comes to about 10 percent of net billings. Cresap goes on to predict that 1958 sales will be lower than in 1957.

For 1959, this is what he sees: lower industrial and heavy equipment billings; higher consumer and light industrial sales.

Queried on new consumer electronic products, Cresap indicated that a home laundry unit with computer might be on the way. He also indicated he felt color tv was still premature. "We carry color tv to supply our dealers with demonstration models," he said.

SHARES and PRICES

MANY WATCH and clock manufactures are becoming increasingly active in the electronics business, particularly in the military area.

First introduction to military work for most of the watch and clock fraternity was through manufacture of electrical-mechanical fuzes and timing devices for explosives. But as need for cannon and antiaircraft shells declined, they shifted their attention to more promising defense areas—like the missile program.

As a result, less of their business has been in the manufacture of electrical-mechanical components and more has been in the manufacture and development of electronic devices and equipment.

Although the bulk of electronic product sales by watch and clock firms is to the military, many also are active in civilian electronics products.

List of military and civilian products manufactured by the six firms listed below includes quartz crystals, aircraft instruments, relays, electronic watches, solar clocks, strain analysis indicators, test equipment, voltage power supplies, pulse forming networks and factory data transmission systems.

Watch and Clock Firms In Electronics	Recent Price	Latest 12 Mos. Dividend	Percent Yield	Earnings Per Common Share 1958	Period	1957	Traded	1958 Price Range
Benrus	5¼	0.10	1.9	0.65	(year)[1]	1.02	ASE	4⅞– 6⅞
Bulova	12¼	0.80	6.5	d-0.13	(3 mos)[2]	0.32	NYSE	9¾–14
Elgin	8½	0.20	2.4	d-0.54	(12 wks)[3]	d-0.13	NYSE	6¾– 9¾
General Time	23¾	1.00	4.2	d-0.72	(24 wks)[2]	d-0.15	NYSE	16⅝–24¾
Hamilton	15¾	0.90	5.7	0.09	(6 mos)[4]	0.27	NYSE	13⅛–16⅜
New Haven Clock & Watch	1⅛	....	...	0.57	(5 mos)[3]	NA	ASE	⅞– 3¼

d—deficit NA—not available [1] ended Jan. [2] ended June [3] ended May [4] ended July

MERGERS, ACQUISITIONS and FINANCE

• **Tenney Engineering**, environmental test equipment manufacturer of Union, N. J., plans to issue 25,000 shares of common stock and $500,000 of 6-percent convertible subordinated debentures. Common stock price and stock conversion price of debentures have not yet been determined. Firm plans to spend proceeds to retire debts, develop new products and finance expanded business in established products. Milton D. Blauner of New York City will handle the underwriting.

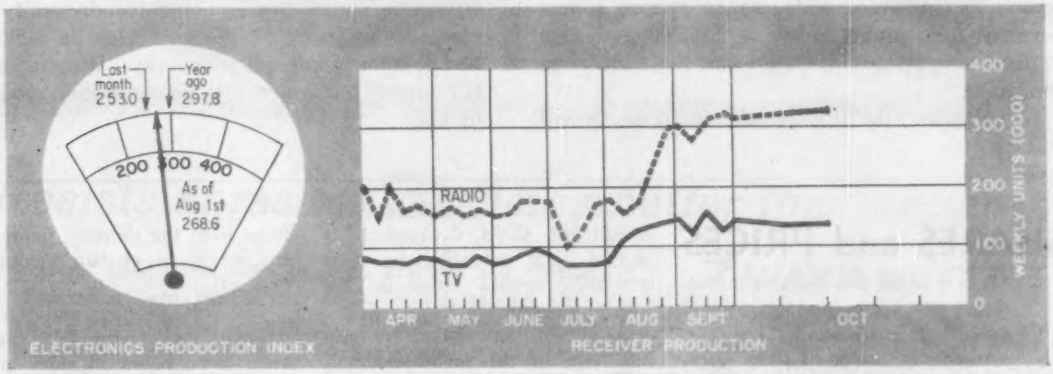
• **Texas Instruments** demonstrates transistor's inner working in visual demonstration exhibit at the New York Stock Exchange. It is believed to be the first attempt to visually explain in a manner comprehensible to the general public the intricate inner functions of the transistor as it amplifies an electrical current. The exhibit model is 25,000 times larger than the actual transistor on TI's production lines.

The display is one of several animated representations featured in the exhibit to tell the story of the Dallas-based electronics manufacturing and geophysical exploration firm. Other displays depict activity which takes place when a geophysical crew explores earth structures for oil or gas deposits. They also show use of firm's telemetering, detection and guidance, navigation and control systems for guided missiles; radar for early warning defense and airport-airway control; and sonar, radar and magnetics systems for antisubmarine warfare.

• **Consolidated Metal Products Corp.**, Albany, N. Y., acquires **Waldale Research Co.** of Pasadena, Calif., through a stock transaction. Price was not disclosed. Waldale is a manufacturer of electronic strain measuring devices. Consolidated manufactures electric and pneumatic transportation equipment.

• **Jetronic Industries**, Philadelphia, Pa., purchases the Miami, Fla., plant of **Bayroad Manufacturing Co.** for more than $500,000 in cash and stock. Bayroad was established two years ago as a metal fabrication subcontractor, primarily in the electronics field. Jetronics plans to turn the plant into one of Florida's leading electronic research and manufacturing facilities. Jetronics manufactures electronic instruments and has developed underwater communication equipment for the Navy.

• **Addressograph-Multigraph Corp.** offers 141,113 shares of common stock to shareholders at $62.50 per share. Some $2 million of proceeds of $8.5 million will be used for electronic product development.



FIGURES OF THE WEEK

RECEIVER PRODUCTION

(Source: EIA)	Oct. 10, '58	Oct. 3, '58	Oct. 11, '57
Television sets, total	127,125	121,495	164,627
Radio sets, total	314,684	309,574	407,298
Auto sets	93,088	103,299	150,075

STOCK PRICE AVERAGES

(Source: Standard & Poor's)	Oct. 15, '58	Oct. 8, '58	Oct. 16, '57
Radio-tv & electronics	59.76	60.36	43.02
Radio broadcasters	72.66	71.02	52.97

FIGURES OF THE YEAR

	1958	1957	Percent Change
	Totals for first eight months		
Receiving tube sales	251,657,000	297,281,000	—15.3
Transistor sales	25,310,834	15,611,300	+62.1
Cathode-ray tube sales	4,952,862	6,236,890	—20.6
Television set production	2,950,455	3,756,533	—21.5
Radio set production	6,611,686	8,765,606	—24.6

LATEST MONTHLY FIGURES

EMPLOYMENT AND EARNINGS

(Source: Bur. Labor Statistics)	Aug. '58	July, '58	Aug. '57
Prod. workers, comm. equip.	354,900	340,600	409,800
Av. wkly. earnings, comm.	$82.39	$80.75	$77.81
Av. wkly. earnings, radio	$81.40	$80.39	$75.81
Av. wkly. hours, comm.	39.8	39.2	39.9
Av. wkly. hours, radio	39.9	39.6	39.9

TRANSISTOR SALES

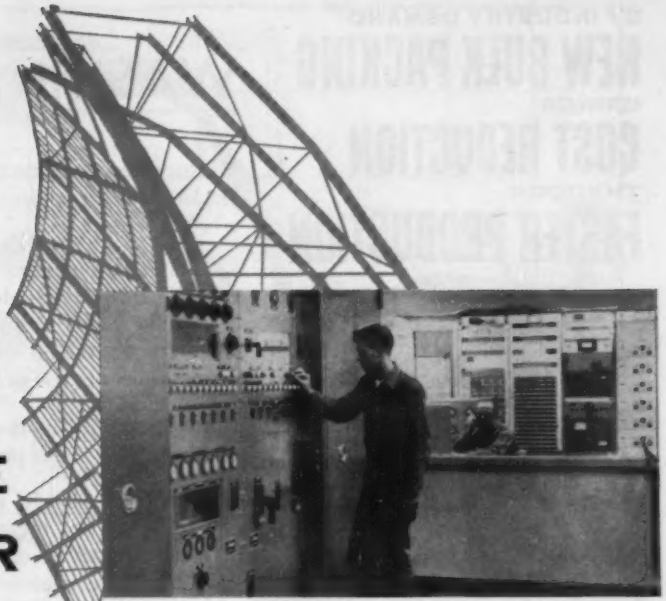
(Source: EIA)	Aug. '58	July '58	Aug. '57
Unit sales	4,226,616	2,631,894	2,709,000
Value	$9,975,935	$6,598,762	$6,598,000

TUBE SALES

(Source: EIA)	Aug. '58	July, '58	Aug. '57
Receiving tubes, units	30,456,000	30,795,000	43,029,000
Receiving tubes, value	$25,442,000	$26,927,000	$34,886,000
Picture tubes, units	713,458	549,817	930,296
Picture tubes, value	$14,190,878	$11,109,048	$17,984,185

FIRST LONG DISTANCE TROPO SCATTER SYSTEM PROVES

- **SSB best for long tropo hops**
- **Longer high-quality hops now feasible**
- **High power is no problem with G-E amplifier**



Klystron power amplifier of new design, featuring higher efficiency, reliability and lower operating cost. The entire system was designed by MIT Lincoln Laboratory in conjunction with Air Force Air Research and Development Command.

Control room showing control console and teletype machines. The system has been designed for ease of maintenance and operation to cope with extreme weather conditions.

Operation of the world's first *long* distance single sideband tropospheric scatter system proves the practicality of SSB for over-the-horizon hops of several hundred miles. Spanning 640 miles between sites near Boston and Winston-Salem, multi-channel voice and teletype communications are maintained with high reliability.

With this system General Electric demonstrates the inherent advantages of SSB for long distance transmission: the ability to get more wide-band signal over long one-hop distances with less power, at less cost.

When considering long-distance communications, remember General Electric's many years of experience in the design and manufacture of high power amplifiers, a key limiting factor in tropo scatter system design. And G-E engineers possess the practical system "know-how" so essential in the design and installation of long-range communication systems. Call these engineers to study your requirements. Military-Industrial Sales Technical Products Department, General Electric Company, Electronics Park, Syracuse, New York.

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NEW BULK PACKING
BRINGS
COST REDUCTION
THROUGH
FASTER PRODUCTION

SOUTHERN SCREW'S new bulk packing system is our reply to a "command performance"! At YOUR request, here is a complete engineered system to help effect new efficiency and speed in materials movement—from your receiving docks to final product inspection regardless of the size of your operation.

SOUTHERN'S completely redesigned 9" x 9" x 6½" telescopic type bulk container (proven in actual year-long tests) is constructed of sturdy 275# test heavy duty board. Standard pallet quantities consist of 36-cartons, 4 layers of 9 cartons to each 30" x 30" disposable 2-way entry pallet. Whether handled manually, or by mechanical or power equipment, Southern's new bulk packing system has multiple advantages that can be prime cost-reduction factors for you: EASIER to STORE, to open and close, to use, to identify, to inventory . . . plus many others!

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WASHINGTON OUTLOOK

WASHINGTON IS PREDICTING that for the first time in a decade factory output of electronic equipment and components will not increase this year, despite a bright second half.

Total electronics product output of about $6.9 billion is estimated for calendar 1958 by the electronics division of the Commerce Dept.'s Business & Defense Services Administration. This is $100 million under the 1957 record of $7 billion. (These figures do not include electronics industry expenditures on research and development.)

A major factor in the downturn for year as a whole: the low volume of consumer electronics production during the first six months.

But the second half is shaping up well. First off, military production is expanding. Then the government reports a "greater-than-seasonal upswing in radio and television receiver output since midyear as general business conditions have improved." (See ELECTRONICS, p 15, Oct. 17.)

The government's industry outlook says that only the military and industrial sectors of the electronics industry will exceed 1957 levels of production. Lower annual output of radio and television receivers will be offset in part by a continued upswing in production of hi-fi equipment—specifically, the boom in stereophonic sound apparatus.

- **Future research** on missile and space-related electronics projects is tied up in the current squabble between NASA, the new civilian space agency, and the Army for direction of the $57.5-million laboratories of the Army Ballistic Missile Agency at Huntsville, Ala., and Caltech's $23-million Jet Propulsion Laboratories at Pasadena, Calif.

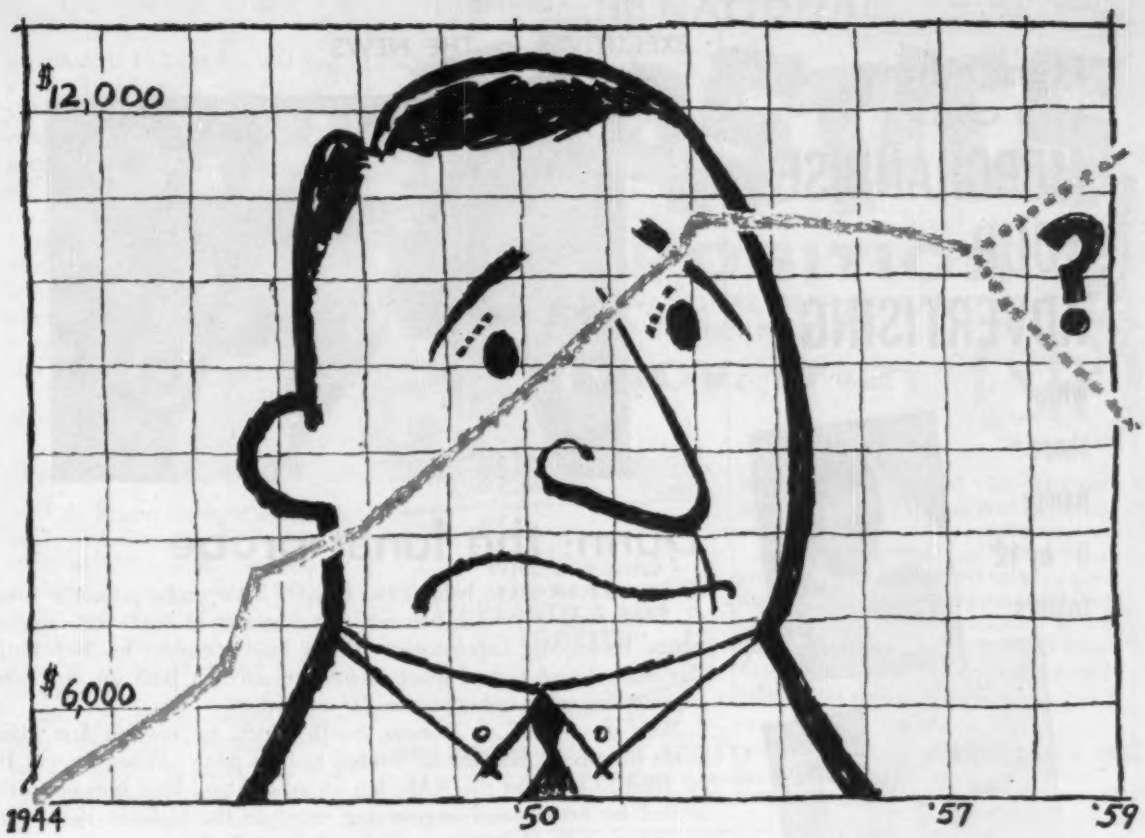
At stake in the NASA-Army controversy is the question of who's to lay out research goals, direct laboratory operations, and award R&D contracts.

NASA has already assumed technical administration of nonmilitary space programs on which both Army facilities are working—the lunar probe, IGY earth satellite, and assorted secret projects. But scientists and engineers there have remained available to the Army for military projects. Now the new agency wants to take over completely.

The Army is resisting NASA's plan, argues that loss of its key space scientists would hold back development of such military projects as the Nike-Zeus, Sergeant, and Pershing missiles, reconnaissance satellites, and advanced high-thrust rocket engines.

Opposition to the transfer also comes from most of the scientists and engineers involved and from many ABMA and JPL contractors who apparently want to continue under the Army's operational control.

Reasons for their opposition are obvious. The individual scientists and engineers now have considerable stature as specialists in the Army, and have had pretty much of a free hand to conduct research. Contractors who have already established valuable relations with Army procurement officials fret over the prospect of having to sell themselves once more to a new set of bureaucrats. They also worry that NASA, in the tradition of its predecessor agency, NACA, may put a new stress on using government-owned facilities for R&D work rather than farming out contracts to private labs.



The "career-curve" of a man named Carter

Charlie Carter started out like a ball of fire. First ten years — terrific! Then he seemed to slow down. Other men — younger newcomers — passed him by. Why?

What happened to Charlie? Nothing. It's what has been happening to industry. Business has become so big and busy, it moves too fast for men who seem satisfied with the status quo. Never have management ranks been so wide open for "get-up-and-go" men.

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EXECUTIVES IN THE NEWS

Dunn: the lunar probe

CHIEF DECISIONMAKER behind the USAF's lunar probe project is Louis G. Dunn, who this week becomes first president of newly incorporated Space Technology Laboratories. Dunn, who celebrates his 50th birthday next Tuesday, is a quiet, deliberate scientist with an enormous capacity for calm and a passion for anonymity.

Born on a ranch in Ermelo, South Africa, he saw his first plane when he was 10, decided he wanted to be a pilot. When he was 18, he tried to enlist in the RAF, but an astigmatism kept him out. He settled for aeronautical engineering, came to the U.S. in 1929, took his B.S. and Ph.D. at California Institute of Technology.

He stayed at Caltech for a number of years, worked from 1936 until the war with aeronautical scientist Theodore von Karman. During the war, Dunn was an assistant chief engineer for Caltech's Jet Propulsion Labs, had a finger in the development of jet-assisted takeoff units, helped evaluate the V-2 rocket. He was naturalized in 1943, served as director of JPL from 1946 to 1954.

From there he went to Ramo-Wooldridge, parent of STL, and played a big behind-the-scenes role in setting up the ICBM projects. As exec v-p and general manager of STL since its inception last year, he has been in active charge of some of the nation's hottest space vehicle and ballistic missile programs.

The sturdy, rugged Dunn is a quiet force who possesses, in the words of a colleague, "an unbelievable intensity of dedication." Neither tub-thumper nor table-pounder, he listens and weighs, rarely says anything until everybody's spoken his piece. Then he makes his own deliberate decision, says a few words to crystallize the matter—"and that," says an aide, "is generally that."

When the pressures let up, he and wife Ruth, a native Californian, like to fish and hunt at his recently acquired northern California ranch "Always with the children," he adds—there are five, three girls, two boys, ranging from 5 to 21. He likes to read, prefers histories and whodunits for relaxation, also likes Kipling, Stevenson and Dickens.

COMMENT

Electronics in Cars

Re "Electronics in Tomorrow's Car" (p 13, Oct. 3): it was interesting to read that "there is little talk . . . of f-m, hi-fi or stereophonic car radios." With speakers all over the car it seems as if stereo would be a natural.

About two years ago I was driv-

ing through Philadelphia and saw a car with a built-in record player. Why can't some shrewd operator come up with a compact battery-operated tape player. It seems to me that such a device would just naturally tie in with stereo systems to make a fine addition to motoring luxury.

A car with a tape machine and stereo sound would be even more a success symbol than one with air-conditioning. Cheaper, too.

R. C. DeWitt

Newport, R. I.

Grammar Revisited

M. L. Mason writes (Comment, p 11, Oct. 3): "*like* is a preposition, not a conjunction. 'As in zoology,' or 'as a cigarette should' is the correct form."

You proceed to take issue with him for his use of *correct* instead of *standard*.

Seems to me you might better have taken issue with his dictionary. According to mine, *like* is a verb, an adverb or an adjective, and not a preposition at all.

S. A. Worley

New York City

We have an even cannier dictionary which points out that the word "is often construed as a preposition," but actually isn't. Further on, our dictionary is open-minded enough to list the word as a conjunction, adding that with complete clauses it is "freely used only in illiterate speech and is now regarded as incorrect."

Any questions?

The Pioneer

I was reading your item "Man May Enter Space in Two Years" (Electronics Newsletter, p 21, Oct. 17) just as Pioneer I was plunging to its fiery doom (as one local paper put it) over the Pacific.

The irony was magnificent.

Sherman Collins

Alexandria, Va.

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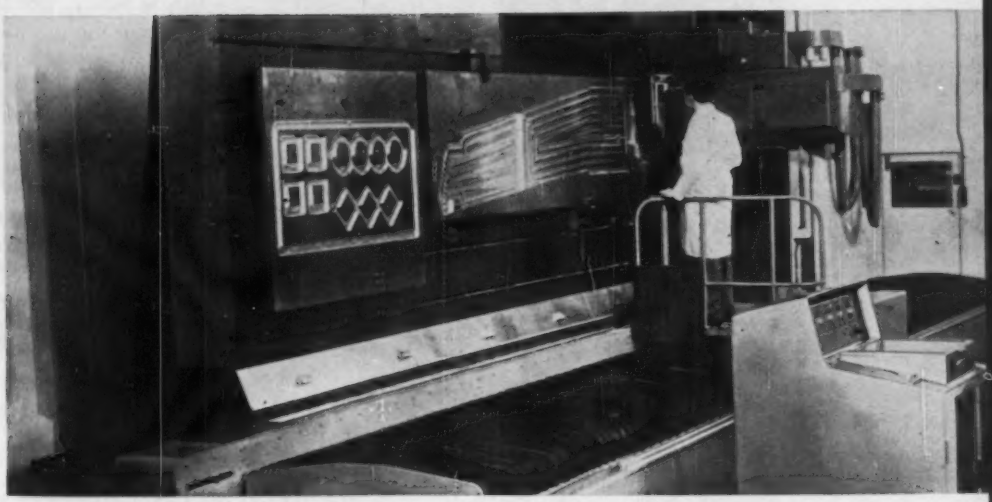


Now used in British aircraft plant is this 50-ton Fairey/Ferranti 3-D high-speed miller with 0.002-in. machining accuracy as . . .

Tools Abroad Go Electronic

Automatic controls for manufacturing processes and machine tools draw attention of industry planners in Soviet Union, Western Europe and Japan. Russians set goals, others enthusiastic but cautious

ELECTRONICALLY CONTROLLED machine tools and other automatic production controls are becoming an increasingly important part of the long-range plans for industrial development abroad.

Here's a country-by-country look at this field:

SOVIET UNION

Workers in heavy industry are being replaced as fast as adequate automatic controls are available. While domestic propaganda glorifies manual labor, Soviet economic planners are pushing for more electronic controls to get higher worker productivity.

Machine tool industry plans to double tool manufacture in the next seven years. "In the next three years," reports Tass, "the industry is to be supplied with no less than 60 new types of automatic and semiautomatic machine tools."

Among the automation gear produced by 1965, said Josef Kuzmin, chairman of the State Planning Committee, will be 2,000 new types of instruments and regulators. Presidium of the USSR Academy of Sciences is reported to be setting up an institute of electronic control devices in Moscow.

GREAT BRITAIN

Britain's interest in control systems for machine tools is gradually stepping up. English companies are quietly increasing their investments in numerical control developments and are already exporting tool controls. Here is some evidence of progress:

- Ferranti Ltd. has six systems in use, with orders for 12 more on hand.
- Vickers-Armstrong (Aircraft) Ltd. is concentrating on point-to-point systems. Vickers has produced two positioning systems and has under development a programmed pipe bending machine.
- EMI Electronics Ltd. is now working on point-to-point systems with future applications to programmed flame cutting for shipyards.
- Five of Britain's nine major aircraft companies have numerically controlled machine tools.

In the continuous contouring field, Ferranti and

EMI differ in their systems philosophy. Ferranti uses a fully digital system with diffraction grating providing the positional information; system includes a special purpose computer. EMI takes the analog approach with a built-in computer providing linear interpolation between the inserted data points. Accuracy is maintained by inserting extra data points that are not change points on the actual work piece. EMI is supplying 14 systems to a U. S. firm supplying skin millers to the USAF.

British firms providing coordinate positioning systems include British Thomson-Houston, Mullard, Ekco Electronics Ltd. and Airmec Ltd.

More than 60 percent of the giants in Britain's aircraft industry are using numerical controls and the electronics industry's full order books mean that there is more to come.

FRANCE

France has been moving rapidly in recent years from pneumatic devices to electronic controls. Automation experts think electronics will largely supersede pneumatic controls within a few years. International trade show of factory equipment last month stressed heavy machine tools automated by electronic controls.

A leading French manufacturer of electronic controls is E.A.M. (Electronique Appliquee a la Mecanique). Principal product, widely used in France and exported to the U. S., is the Stop-Cote electronic control for grinding machines. E.A.M. also turns out automatic gaging equipment, used mostly on automatic lathes, and two types of controls for the manufacture of ball bearings.

Manurhin (Manufacture de Machines du Haut-Rhin), a leading machine tool producer, makes electronic measuring apparatus. Cie. Electro-Mecanique has developed machine-tool controls using magnetic tape which were first demonstrated two years ago. So far, magnetic-tape controls made by the firm are used on automatic welding machines.

WEST GERMANY

The two associations most closely connected with both users and designers of electronic equipment, the Association of German Machine Tool Builders and the German Electrical Manufacturers Association, consider that electronic controls are still at the stage where markets and trends in applications cannot be gaged accurately.

About one-fifth of all control equipment presently being manufactured in Germany is electronic, compared to one-third for pneumatic, one-third for purely electrical, and the remainder for hydraulic. However, only a small fraction of electronic gear is used with machine tools or production lines.

Siemens believes electronic controls could eventually be adapted for any machine-tool type or automatic assembly units, or on production lines. Firm sees economic feasibility as the big question. Brown Boveri sees little chance now of wide application in the machine tool and allied industries.

Machine tool manufacturers feel that future requirements will be limited, except for small tools such as lathes and millers. Most promising controls stress widely variable regulation of speeds and rates of feed.

Recent showings of machine tool controls include: AEG punched tape control for a Gebrueder Heller milling machine; Metrawatt AG (of Nuremberg) controls for continuous contour machines; digital coordinate-positioning device used by Schwarzkopf AG (of Berlin) on automatic gage-producing machine; Brown Boveri pushbutton data storage unit for Schiess AG (Duesseldorf) milling machine.

JAPAN

Japan is excited about use of electronic controls in heavy industry. A plant control committee set up this year by the Japan Electronics Industry Association wants to improve the country's showing in the race for higher productivity. Heavy industry needs are a far cry from traditional hand skill and efficiency in light industry. Japanese feel they must produce higher quality goods at relatively low cost to compete in markets eyed by Red China and the Soviet Union.

In three years Fuji Communication Machinery Mfg. Co. has supplied three numerical controllers using magnetic tape, two card-controllers, a punched-tape controller and two curve tracers. Next year the firm hopes to sell about 10 milling control units, five 2D positioners and five automatic curve-tracers, and sees a steadily expanding market after 1959.

Hitachi Works has supplied three machine tool units in the last three years to two milling machine firms and a plane miller company, and hopes to sell at least three more next year. Relative advantages and cost of tracing, numerical and programmed controls are now being studied, Hitachi added.

Fuji says it's considering manufacture of automatic assembly controls for aircraft, shipbuilding and auto production—three markets now in sight.

Hitachi makes automatic controls for production lines of aircraft and other plants, reports it sold 35 transfer machines and three numerical control machines in the last three years. Size of Japanese market for assembly line controls, Hitachi said, is expected to be about five units next year, 25 in the next five years. Controls are both tracer and numerical.

Radar detector (circle) monitors Baltimore intersection as . . .

Electronics Speeds Traffic

Increasing number of U. S. streets and highways are being provided with electronic sensing devices. Result: a growing market in equipment for solving mounting traffic problems

ELECTRONIC CONTROL of vehicular traffic, virtually unknown at the end of World War II, is now used in all 49 states.

Industry estimates are that this year's sales volume will be about $15 million. A rule of thumb derived by one study group is that most cities of 50,000 population or more spend from one to two dollars per capita on traffic control materials. An increasing portion of this spending is going for electronic equipment.

Aim of electronic traffic control systems is to replace rigidly operating, mechanically-actuated devices with flexible electronic systems that can measure traffic flow, process derived data through computers, and govern vehicular movement on a city-wide basis.

As one manufacturer told ELECTRONICS: "Now most traffic is governed by the signal system. We want to reverse this and let the signal system be governed by the traffic."

First step in an electronic traffic control system is measurement of traffic flow to provide computer input information. This may be done from the roadbed by means of pressure plates or buried magnetic loops. It may also be done by overhead radar detectors to count the cars. The method used depends on a number of varying environmental factors, such as type of roadbed, availability of cable outlets, and prevailing interference possibilities.

Check this week with Federal Communications Commission shows present traffic control authorizations for vehicular radar transmitters number about 5,200. Licenses are held by more than 80 municipalities. Five years ago, says the Commission's Safety and Special Service Bureau, there were "practically none."

All present authorizations are at 2,455 mc. Additional authorizations have been set aside at 10,500 mc and 10,550 mc for future expansion. Radar detectors emit a tight beam. (Cover photo shows installation by Automatic Signal Div. of Eastern Industries, Inc.) Detectors can be placed 12 feet apart without interfering with each other.

Information collected by the detectors is sent to computers by cable or radio. Relative merits of the two means of transmission depend on location. Radio requires no digging or pole system, but may be subject to interference.

Computers vary in size and complexity from small units handling one intersection, to giant installations which analyze and solve heavy metropolitan traffic movement problems. These large installations can be programmed to set as many as six different patterns in operation.

Some things an integrated electronic traffic control system can do are: note increased early morning rush-hour traffic and favor inbound vehicles, later in the morning return signal cycles to "normal"; favor traffic movements onto main highway feeder roads; and in general, speed traffic flow more rapidly than ever before possible.

Radio - - - and the Moon Rockets

"WITH VERY LITTLE more energy we can go far beyond the moon and be off to Mars and Venus. We need no basic change of hardware. We have the right combination of boosters."

This week's overall evaluation of United States moon rocket capabilities comes from Simon Ramo of Ramo-Wooldridge's Space Technology Labs in Los Angeles. The labs direct scientific phases of the Air Force missiles program.

Pioneer I blazed a brilliant path. Driving the moon rocket's 82.7-lb payload was a 3-stage, 88.1-ft ABLE-I missile configuration (Thor, modified Vanguard, and special 400-lb solid-propellant rocket).

Programmed autopilots in the first and second stages controlled initial part of flight. Deviation from expected course was due to fact that Thor and modified Vanguard stages were programmed too high, causing vehicle to "loft" slightly. Loss of thrust prevented its outracing tug of earth's gravity.

Actual weight of instrumentation package (oscillators, amplifiers, microphones, transmitters and tv scanning system) was 39.6 lb. Perhaps the most vital item in payload was the 63-transistor Doppler receiver (5.3 lb, complete with chemical batteries) which doubled as microlock receiver and command link with earth.

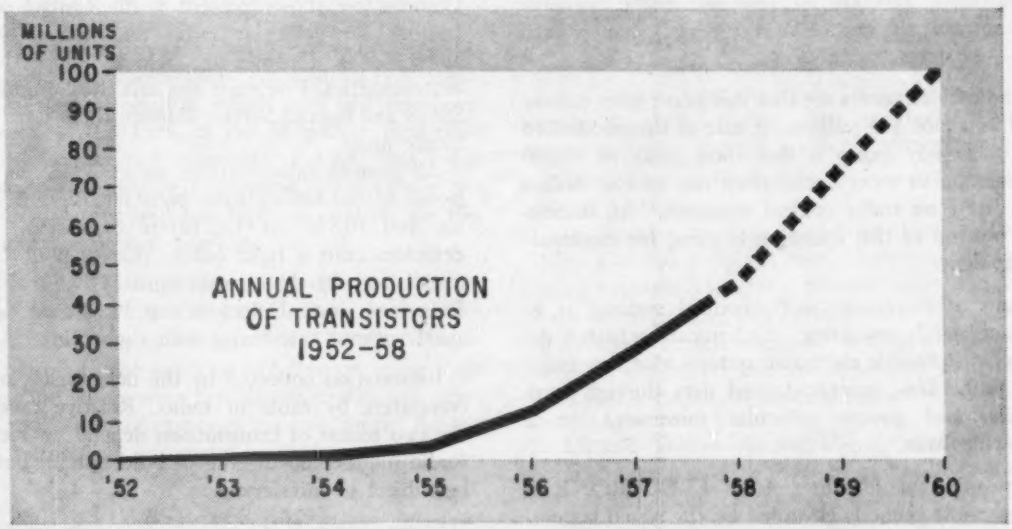
Capable of accepting six commands, this unit acted on signal to separate payload from third stage, to fire vernier rockets, and to ignite the retro rocket.

Monitoring and tracking of moon rockets is accomplished by a network of five principal radar and radio stations. Largest tracking device is England's 250-ft radio telescope which picked up Pioneer I 10 minutes after blast-off.

Information received at farflung tracking stations is immediately teletyped to nerve center of communications network at Space Technology Labs. There, raw information is fed into an IBM 704 for analysis.

Intensity of magnetic field at low and high amplitudes is measured by a specially developed magnetometer (accuracies within 5 microgauss).

PRODUCTION and SALES



Transistor Output Hits New Monthly Peak

PRODUCTION of transistors in August soared almost two-thirds beyond preceding month's figure to an all-time high of nearly 4.3 million units. This new monthly record replaced previous peak reached in Nov. 1957 when manufacturers produced 3,578,700 units.

Since 1954, when yearly output first pushed beyond the one million mark, transistor production has more than doubled every year. This won't happen in 1958 even though this year's output is expected to be at least 60 percent above 1957's 28 million. Projection of 1958 curve past August to end of year, based on past performances and seasonal fluctuation patterns, indicates 1958 final figure of 45 million units.

Transistor dollar volume has not increased nearly so sharply because production improvements have brought price decreases every year. Average unit price was $3.85 in 1954, is now $2.35. Increasing needs for reliability, miniaturization and lower power consumption all point to continuing growth of transistor production and sales.

Organizing Market Research

There's more to it than just setting up a special department. Where will it fit in the company organization? Should it be headed by a research expert? Or should the top man be an engineer?

ELECTRONICS INDUSTRY leaders think several hundred firms and divisions in the industry will set up market research departments in the next few years.

Industry management sees marketing research as a highly useful tool for keeping abreast in the new products race, getting in on the expected boom in industrial electronics, and meeting competition.

But between the decision to embrace market research and the establishment of an effectively functioning department there are problems.

Those with responsibility for initiating formal market planning work believe marketing research can work miracles in improving market and product planning efforts. However, the new research department could also fizzle.

Fact that management of many electronics firms have had little or no previous experience with market research, and that their engineers and other core personnel have had less, adds to the problem.

Interviews by ELECTRONICS with management and marketing executives in electronics and other industries point to two key areas of management decision in setting up a market research department:

- Place of marketing research in the organizational scheme of responsibility and authority.
- Selection of market research dept. personnel.

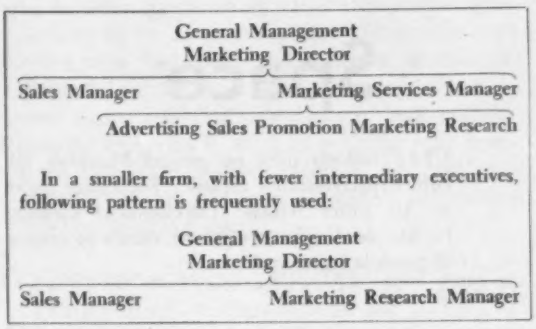
Key to proper position of market research in the organization is the principle that marketing research can be of value only if the information it supplies helps improve management decisions.

"You have to keep marketing research information oriented to decisions you need to make in your business," said Alfred Di Scipio of McKinsey & Co., management consultants, at a recent A. M. A. conference on Industrial Marketing Research.

The inescapable conclusion is that the marketing research departments of electronics firms should be placed close to general management.

In some cases one finds the market research manager of an electronics firm reporting directly to the president or executive vice-president. This situation often exists among small firms where one or two officers exercise all executive functions.

Most big-firm executives favor some form of the following plan:



However, experts also say this does not mean other systems of organization will not work. Many in our industry can point to instances where placement of marketing research under authority of the sales department has worked most satisfactorily.

Recently Al Chapple, manager of market research for Perkin-Elmer, made a survey among 22 electronic instrument firms. He found the marketing research department reporting directly to company officers or general managers in eight companies. In six cases the department reported directly to individuals responsible for sales or marketing.

Debate over question of what kind of a man do you hire to head the marketing research department of an electronics firm is raging.

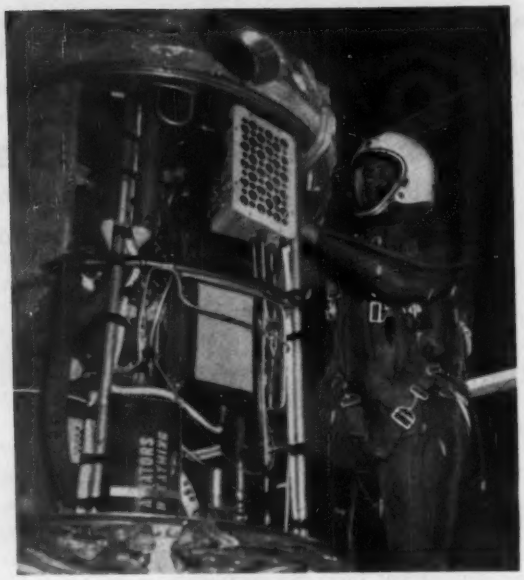
Point of discussion is: do you hire a man with professional marketing research experience or do you hire a man whose primary experience is in engineering and the electronics industry? Rarely do you find a man with experience in both areas.

Conclusion reached after many such discussions is that perhaps more important than the background of the individual applicant is the man himself.

A further conclusion reached on this subject is: The greater your firm's interest is in new product research, the greater is your need for technically trained men.

"A new product market researcher should be technically trained or have a substantial body of technical knowledge," warns Cy Paquette, manager of new product market research at Corning Glass Works. "He must be able to keep himself informed of technical surveys and read technical abstracts in order to know what's going on."

Man Into Space



USAF balloon pilot on project Manhigh III enters space-research capsule. Successful flight at Air Force Missile Development Center, N. M., used radio equipment shown in center of gondola framework

WITH U. S. AIR FORCE PROJECT MANHIGH III—The plan of the Defense Dept.'s Advanced Research Projects Agency, announced Oct. 7, "to have a man in space within 24 to 36 months," got a mighty push 24 hours later when Lt. Clifton McClure rode a 200-by-280-ft plastic balloon nearly 100,000 ft above the earth.

McClure was surrounded by and connected to an extensive array of electronic equipment.

The test was conducted by the Air Force Missile Development Center, N. M., and Winzen Research Corp. of Minneapolis. Purpose of the flight was to continue research in space medicine. "The balloon capsule," said Lt. Col. David Simonds, project officer, "is the prototype of a manned-spaceship cabin."

During the flight psychological and environmental conditions were radioed to the ground by a conventional f-m/f-m telemetering link. The telemetering equipment had three subcarrier channels.

Channel one sent electrocardiograph data (ekg). Both heartbeat and ekg profile were transmitted. Signal bandwidths ranged from 0.01 to 100 cps. The telemetering channel ran steadily during flight.

Second telemetry channel transmitted respiration rate and profile. It also ran continuously.

The third channel was commutated and sent various physiological and environmental data. Physiological data on channel three included: basal skin resistance (bsr), a measure of psychological stress; and body temperature measured at three points.

Environmental conditions sent on channel three included: capsule temperature and pressure and capsule skin temperature measured at five points. Time-reference data was also sent on this channel.

Primary voice communication was on the Unicom frequency of 122.8 mc. Provision was made to shift to 121.5 mc if necessary.

Balloon altitude was transmitted on a 1,710-kc radio link that was also used to track the balloon.

The 1,710-kc frequency could be received by any tracking plane's automatic direction finder.

In the event of failure of the primary vhf communications link, the 1,710-kc beacon frequency could be modulated to carry voice signals. The balloon pilot would then receive messages from the ground on a 6,700.5-kc receiver.

The 6,700.5-kc circuit also served the command termination equipment. This is a three-combination electronic lock that enables a controller on the ground to terminate the balloon's flight if the pilot is unable to do so. The command termination circuit is so arranged that voice transmission or interference on the same r-f channel has only one chance in 200,000 of accidentally terminating flight.

In all, 32 transistors were used in audio and switching circuits. Winzen's engineering staff reports it did not encounter any trouble from cosmic rays.

Power was supplied by 18 lead-acid 24-v storage batteries pressurized to 80,000 ft to prevent water evaporation from the electrolyte. Lead-acid cells were used as part of balloon's ballast and dropped by parachute when discharged. The power pack included a group of silver cells for emergency.

In addition to the telemetered data, instruments were sent aloft to study sky brightness and incidence of cosmic and other radiation. The cosmic ray scintillometers and other radiation-monitoring plates were fastened about the pilot's body. Sky brightness was measured by a spectral spot photometer calibrated from 0.5 to 50,000 ft lamberts.

ENGINEERING REPORT

Tubes Vital in Atoms-for-Peace Research

ROLE OF ELECTRONIC CONTROLS in the peaceful harnessing of thermonuclear energy was underscored last month when Princeton University unveiled for the press the recently declassified Project Matterhorn. Plans were disclosed for the Model C Stellerator, a $34-million program to be carried out by RCA and Allis-Chalmers through an organization called C Stellerator Associates. Apparatus includes an electronically controlled motor generator setup that will provide 50,000 gauss magnetic containing field. Machine will use both ohmic heating and magnetic pumping. Ohmic heating will be coupled to plasma through two transformers energized from a large capacitor bank and controlled by high power electron tubes. Current produced in plasma: 34,000 amp. Ion heating gear, also controlled by high power tubes, will supply 50 megawatts for many milliseconds. Machine may start preliminary operation next September; it's expected to permit measurements in plasma behavior previously impossible or difficult.

MIDAIR COLLISION SAFEGUARD was proposed in Canada last month. Raytheon demonstrated a tv presentation system which it proposes to integrate with a long-range radar network already being installed. Firm is already supplying all-weather surveillance radar to 15 Canadian airports under a $5-million contract with the Department of Transport. At Toronto's IRE show Raytheon showed how the tv presentation would work by linking it to a new radar at Malton Airport. Radar data is sent via microwave link to monitor point where crt storage holds it for reading by flying-spot scanner. Single 21-in. tv-type tube can hold entire flight picture for 100-mile radius; it shows continuing course of each plane, enabling controllers to spot collision courses at a glance, even in a brightly lit room. Firm says long range of radars will permit overlapping pattern and provide almost continuous coast-to-coast coverage.

TEMPO OF IGY INVESTIGATIONS steps up as spring comes to the Antarctic and IGY's Dec. 31 end looms. American scientists in powerful tractors equipped with electronic gear for detecting crevasses will make three overland traverses while others will make an airborne traverse. They aim to collect seismic, glaciological, meteorological and other data about the subcontinent.

DEMAND FOR ENGINEERS over the next decade will rise sharply, according to a survey by Scientific Apparatus Makers Association. Many electronics firms indicate an increase in requirements of from 50 to 100 percent by 1968. And nontechnical firms are going to be competing more for electronics engineers.

TECHNICAL DIGEST

• **Information** stored magnetically in thin magnetic film is extracted optically at Lincoln Lab by utilizing Kerr magneto-optic effect. This causes rotation of plane polarized light, in direction depending on magnetization, upon reflection from magnetized surface. Drawback is relative weakness of effect; films of silicon monoxide about 1,000 angstroms thick, giving rotation of only 0.186 degree, are best known to date.

• **Metal ring** coated with powdered glass permits making glass-to-glass seals by induction heating at high speed on automatic machine at Trans-Sil Corp. for flameless assembly of diffused silicon rectifiers in all-glass housings. Fusion is done under bell jar connected to vacuum pump, so that each diode is evacuated. Output of machine is expected to be 1,000 units per hour.

• **Single crystals** of bismuth telluride have been grown by Air Force Cambridge Research Center as a cylindrical compact pulled slowly out of melt. This separates easily into thin, narrow sheets much like mica, to give pure crystals for thermoelectric power generation.

• **Far infrared** region of spectrum, useless for long-range communication in earth's atmosphere because of attenuation, shows promise for space communication and radio mapping of moon's surface. Chief problem is harmonic generation of required submillimeter waves with sufficient power and frequency stability.

• **Cavitation** at valves, pumps and elbows in liquid oxygen lines, cause of erratic operation of missile propulsion systems, produces an a-c voltage that can be picked up with sensing grids and amplified enough to actuate alarm system. This phenomenon, being explored at AiResearch, is traced to existence of high-intensity omnidirectional magnetic field adjacent to gas bubbles in cryogenic fluids. These moving fields generate voltages in conductors.

Tape System Uses Bobbins

CAROUSEL magnetic tape memory is said to be faster than conventional tape memories. The system was developed by the electronics division of Atvidabergs Industrier, Stockholm.

Instead of one long tape, as in most conventional designs, the Facit ECM uses 64 bobbins, each containing 28 ft of tape.

The light metal bobbins are attached concentrically by a spring system to shaft pins protruding from a circular disk that rotates on a horizontal axle. The bobbins are interchangeable, and the whole carousel is easily removed for filing in an archive.

Code symbols on the disk axle designate contents of bobbin tapes. By indicating the symbol desired, the disk rotates the selected bobbin toward the reading and recording head below the center of the disk. The disk can rotate in either direction, whichever results in the least rotation for the selected bobbin to reach the head.

When the disk stops at the correct position, a weight at the free end of the tape is released. The tape unreels downwards into a tank. Speed is self-regulating both in the downward movement and in rewinding.

The new memory is an external unit, designed primarily for the Facit data-processing machine, but is adaptable for other makes.

Time required for electronic selection of the desired program depends on the central machine. Once this selection has been made, the memory handles the remaining processing in 0.6 to 3.2 sec.

Light-weight bobbins with 28 ft of magnetic tape are said to reduce time required to select blocks of information

A fully utilized carousel memory can store over 3 million alphanumerical signs or 5.2 million decimal figures.

Radar Offers High Resolution

Airborne radar system, being produced for the U. S. Army Signal Supply Agency by Philco, is intended for use in drone reconnaissance aircraft. System is an out-growth of research by Navy, Air Force and Signal Corps with several universities participating. Signal-processing technique called Redap is said to improve resolution

MEETINGS AHEAD

Nov. 6-7: Nuclear Science Meeting, 5th Annual, PGNS of IRE, Villa Motel, San Mateo, Calif.

Nov. 10-12: Physics and Medicine of the Atmosphere and Space, USAF School of Medicine, Hilton Hotel, San Antonio, Texas.

Nov. 17-20: Magnetism and Magnetic Materials, AIEE, APS, IRE, ONR, Sheraton Hotel, Philadelphia.

Nov. 17-20: Weather Radar Conf., Univ. of Miami, Miami Beach, Fla.

Nov. 19-20: Northeast Electronics Research and Eng. Meeting, NEREM, IRE, Mechanics Hall, Boston.

Nov. 19-21: Electrical Techniques in Medicine and Biology, AIEE, ISA, PGME of IRE, Nicollet Hotel, Minneapolis.

Dec. 2-4: Reliable Electrical Connections, EIA, Statler-Hilton Hotel, Dallas.

Dec. 3-5: Global Communications, AIEE, PGCS of IRE, Colonial Inn-Desert Ranch, St. Petersburg, Fla.

Dec. 3-5: Eastern Joint Computer Conf., AIEE, ACM, IRE, Bellevue-Stratford Hotel, Philadelphia.

Dec. 4-5: Vehicular Communications, PGVC of IRE, Hotel Sherman, Chicago.

Dec. 9-11: Mid-America Electronics Convention, MAECON, Municipal Auditorium, Kansas City, Mo.

Jan. 12-14: Reliability and Quality Control, 5th National Symposium, PGRQC of IRE, ASQC, EIA, Bellevue-Stratford Hotel, Phila.

Jan. 29-30: Long-Distance Transmission By Waveguides, Institution of Electrical Engineers, London, England.

Feb. 12-13: Transistor & Solid-State Circuit Conf., AIEE, PGCT of IRE, Univ. of Penn., Phila.

Mar. 3-5: Western Joint Computer Conf., AIEE, ACM, IRE, Fairmont Hotel, San Francisco.

Mar. 23-26: Institute of Radio Engineers, IRE National Convention, Coliseum & Waldorf-Astoria Hotel, New York City.

Apr. 5-10: 1959 Nuclear Congress, sponsored by over 25 major engineering and scientific societies, Public Auditorium, Cleveland.

Apr. 16-18: Southwestern IRE Conf. and Electronics Show, SWIRECO, Dallas Memorial Aud. & Baker Hotel, Dallas.

	Tensile Strength (psi)			Plastic Temp.
Soft solders	**—320 F**	**80 F**	**—**	
95Sn-5Sb	12,600	5,900	—	450 F
97½Pb-1½Ag-1Sn	9,000	3,600	—	580 F
Silver solders	**—424 F**	**—320 F**	**63 F**	
45Ag-30Cu-25Zn	75,000	74,000	61,000	1,250 F
70Ag-20Cu-10Zn	57,000	54,000	34,000	1,335 F

Several alloys, able to withstand high and low temperatures, give. . . .

Solder: More Strength

Improved soldering techniques, materials selection reduce solder joint failures

SEARCH FOR BETTER soldering methods to cope with greater environmental hazards and more stringent reliability requirements, particularly in military equipment, will be a dominant topic at the Third EIA Conference on Reliable Electrical Connections, in Dallas, December 2-4.

B. A. Gerpheide of Hughes Aircraft, for example, reports that in one airborne digital computer there are 400 circuit boards with 60,000 to 70,000 solder connections. Present reliability goal is one failure in 20,000 connections after 1,000 hours of operation. Future expectation is one failure in 50,000 at 2,000 hours.

Such quality levels cannot be achieved by even 100 percent visual inspection, he says. He outlines a program for meticulous control over materials, board processing, tools and manufacturing techniques.

E. W. Broache and A. T. Hamill, of Westinghouse Air Arm, point out that soldered joints should not be depended on to retain strength under strong vibration, but must do just that in airborne equipment. The division reverted to hand soldering eyelets in boards because thin films of dipped solder cracked around eyelets. A return to dip soldering is feasible if boards are first coated with plastic, except at the joint area. This counteracts the tendency of the solder to pull away from the board and results in a teardrop of solder at the joint.

Bell Telephone Labs gets good results by resistance fusing eyelets, terminals and contacts to circuit boards, reports E. D. Knab. Printed wiring land areas and components are pretinned or solder coated. The components are then inserted in place and clamped between the electrodes which carry the fusing current. The technique, applied to an eyeletting machine, has resulted in a process that is fast and inexpensive, he says.

Resistance soldering machines, which eliminate the voids usually found in soldered hollow pin connectors, have been developed by GE's Light Military Electronics department, according to Kurt B. Fischel and Fred D. Olney. Multipin connectors are loaded with tube-shaped preforms. The preforms are spring-wound inexpensively from flux core solder wire.

John T. LaForte, also of GE, reports that a casting method of grounding coaxial cable shields has been used for seven years without a single equipment field failure blamed on the joints produced. The stripped ground lead is wrapped around the bare shield. The joint is placed in a mold which applies just enough solder to fill the interstices in the shield braid and between the lead and braid.

Usual temperature limits for soldered joints is 300 F, but there are already requirements for 400 F and 500 F operation. A Hughes Aircraft study, reported by G. L. Branch and R. Y. Scapple, found the requirements can be met by soldering with lead containing 1.5 percent silver and one percent tin. Conductors, however, must be preplated with nobler metals.

The same solder formulation was also recommended for low temperature use by A. B. Kaufman, of Arnoux Corp. (see table). Strength of tin-lead solders can be improved at low temperatures by adding antimony. Silver solderability is improved by tin. There is also a good refrigeration solder commercially available, made of 95 percent tin and five percent antimony. Missile components, Kaufman warns, sometimes face —200 F temperatures due to use of liquidified gases as fuels.

EIA's Dallas meeting will be the first national conference at which no papers will be read, reports general chairman R. George Roesch, president of the Eraser Co. All conference papers will be made available prior to the conference, all sessions will be devoted to discussions among the authors and the audience. No proceedings will be published. Attendance will be limited to 1,500.

Strip Windings Tried in Coils

ALUMINUM STRIP coil winding techniques are being investigated by Aluminum Co. of America in cooperation with some 30 coil manufacturers. Studies indicate that aluminum strip windings would save money if used in coils that would otherwise use Awg 24, or larger, wire.

Alcoa has bought the transformer division of Automation Instruments and is using its equipment to produce test coils. Specification coils are being turned over to the coil manufacturers for testing. Coils wound from strip range from electronic-sized solenoids to 50 kva transformers.

In addition to attempting direct substitution of strip for wire, the investigation includes the use of unconventional insulation, interleaving and spacing materials. Goal is the application of mass production techniques to strip winding.

Man-Rocket Guidance Ready

Miniaturization and new design eliminate black boxes, save space and weight

THE X-15's INERTIAL guidance system (ELECTRONICS, p 16, June 20) will get its first flight test next month in an NASA-operated F-101 Voodoo. Guidance system for the X-15 itself will be delivered in December.

Initial flight of the manned rocket is scheduled for January. It will probably be a free fall, without power, guidance or pilot, from a B-52 flying at 45,000 ft. First powered flight is slated for February.

Full performance of the X-15 may achieve velocities up to 4,500 mph and an altitude of 400 mi.

Though only three X-15's have been ordered, it is conceivable that Sperry will build six or more guidance systems. Spares for the X-15 will be needed as well as units for the F-101 test flights.

Sperry's business to date on this project amounts to approximately $2.5 million. Deliveries will continue well into 1959. Cost of the entire X-15 project has been pegged at $120 million, plus the cost of laboratory and wind tunnel testing by NASA. More than 300 firms have contributed to the X-15 project.

By using advanced miniaturization techniques, the small, light weight guidance package consists of only two pieces of hardware: a 3-gyro stabilized platform and a computer. Amplifiers and power supplies are mounted on the platform itself, thereby eliminating the elaborate array of black boxes usually used in such a system.

Each component is able to withstand accelerations of more than 10 g's, as well as a state of weightlessness.

The computer digests and interprets data and displays it pictorially for the pilot on cockpit instruments.

In addition to providing inertial information for the cockpit instruments, the system's sensors and computer will feed data to specialized airborne and ground-based recorders for permanent charting of each flight.

The X-15 system accepts exact velocity signals from a Doppler navigation system in the B-52 "mother plane" until the moment of launch. Thereafter it functions as a pure inertial system.

The X-15, weighing 31,276 lbs when launched, will carry 1,300 lbs of instrumentation.

MILITARY ELECTRONICS

• **System for delivering** supplies by ballistic cargo missile has been developed for the Army by Convair. Called Lobber, the missile can deliver rations, ammunition, medicines, communications equipment or other vital supplies to front line troops with accuracy, Convair says. USAF's F-104 Starfighter will be equipped with an Aerojet infrared fire control device as well as a visual sight system.

• **Another infrared detector,** mounted on a naval gun mount, tracked Sputnik III last month as it passed through the predawn skies of southern California. Basic equipment was the Aerojet Model S8 Infrared Tracker—a small instrument with a folded reflecting optical system. Although only six inches in diameter, the S8 has the same basic configuration as the Palomar and Mt. Wilson telescopes. A lead sulfide detector cooled to −78 degrees C was used.

• **Army says its lunar probe** try will have a 50-50 chance of reaching the area of the moon. Reason for this advantage over USAF's two attempts: Army will have more ground control after launching. "A human being will set foot on the moon in 12 years," Maj. Gen. J. B. Medaris, Army Missile Command head, said.

• **Observations of celestial bodies** through a 36-in. telescope mounted in an 80,000-ft-high balloon will be televised back to earth during project Stratoscope II next summer.

Project will be sponsored by the National Science Foundation and Office of Naval Research. Perkin-Elmer will design the telescope.

CONTRACTS AWARDED

Federal Telephone and Radio Co. gets a $15,615,890 contract with CAA for equipment for 196 complete VORTAC ground stations.

Ryan receives a $20-million Navy contract for production of automatic radar navigation equipment for Navy aircraft.

Laboratory for Electronics is awarded an $18,744,994 contract with AMC for Doppler-radar system AN/APN-105, spare parts, ground support equipment, training parts, flight test and data to be used in the F-105.

Kollsman gets a $3,498,683 follow-on contract with AMC for MD-1 astro compass units and components for use in the B-52.

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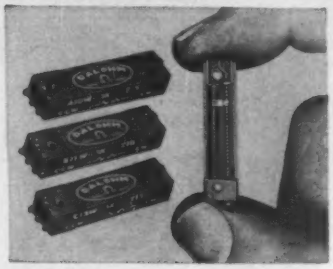
NEW PRODUCTS

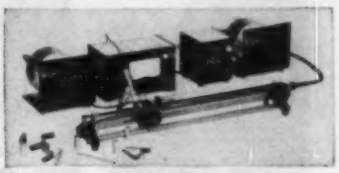


Potentiometer trimmer type

DALE PRODUCTS, INC., Box 136, Columbus, Neb., announces a new line of subminiature wire wound trimmer potentiometers that meet broad industry requirements. The A10-W, B11-W, and C12-W models measure 0.22 by 0.31 by 1.25 in.; weigh 2.25 grams and have a full 25-turn adjustment that will not shift under severe vibration or shock. A clutch arrangement prevents breakage due to over-excursion of the wiper. Complete technical information is given in bulletins R-32, R-37 and R-38 now available. **Circle 50 on Reader Service Card.**

Slotted Line highly accurate

GENERAL RADIO CO., 275 Massachusetts Ave., Cambridge 39, Mass. Dielectric constant and dissipation factor of low-loss solid insulating materials can be measured directly and easily in the 200-5,000 mc frequency range with the type 874-LM dielectric measuring line. Accurate measurements on materials having dielectric constants between 1 and 10 and dissipation factors between 0.0001 and 0.05 can be made with an accuracy of about ± 2 percent in dielectric constant and ±(5 percent + 0.0001) in dissipation factor. The type 874-LM itself is priced at $400. A generator and detector with associated pads and filters are



necessary for the complete measuring system and are also available from the company. **Circle 51 on Reader Service Card.**

Precision Oscillator transistorized

DELTA-F, INC., 113 E. State St., Geneva, Ill. Any frequency from 400 cps to 10,000 cps can be obtained in a new all-transistorized oscillator without the use of dividers or multipliers in a 1½ by 1½ by 2¼ in. package. A frequency tol-

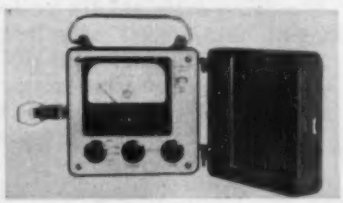
erance of ± 0.005 percent (50 parts in a million) or better for an operating temperature range of −55 C to + 125 C is standard for the DFO-51 precision tuning fork oscillator. An output power of 5 v rms across a 10,000-ohm load with a wave form essentially sinusoidal requiring a supply of between 6 and 30 v as specified, are some of the operating characteristics. **Circle 52 on Reader Service Card.**

Indicating Light subminiature

THE SLOAN CO., 4101 Burbank Blvd., Burbank, Calif., announces the type 855RE subminiature Color-Lite for indicating and edge-lighting Lucite panels. No bigger than a jelly bean, it projects only 0.125 in. in front of the panel. Primary applications include edge-lighting aircraft panels, test equipment, and laboratory test panels. **Circle 53 on Reader Service Card.**

Power Bridge transistorized

AIRBORNE INSTRUMENTS LABORATORY, 160 Old Country Road, Mineola, N. Y. A new transistorized precision power bridge makes it possible to obtain fast, accurate and direct readings of microwave measurements. Type 50 is a self-balancing device which permits direct readings of r-f power in watts and dbm. It consists basically of an audio oscillator and a bridge in a closed-loop circuit. The amplitude of the audio signal is variable and is dependent upon and controlled by the condition of balance of the bridge. Balance of the bridge is dependent upon the total power in the thermistor which, through the action of the closed loop, is main-

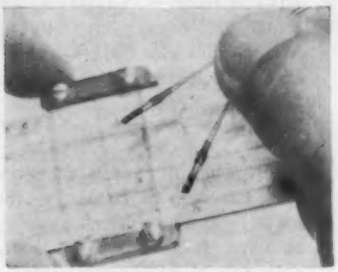


tained at a constant value P_t. **Circle 54 on Reader Service Card.**

Silicon Rectifier diffused junction

BRADLEY LABORATORIES, INC., New Haven, Conn. New type of diffused junction silicon rectifier features built-in insulation that electrically isolates the semiconductor from the head and screw of the mounting stud. The stud screw can be

threaded directly into the heat sink, eliminating the cost of using and assembling separate insulating washers and such auxiliary hardware as lockwashers and nuts. Heat dissipation is more efficient and uniform. The bonded contact between case and heat sink provides direct paths of thermal conductivity, uninterrupted by the air space that exists in present assemblies. **Circle 55 on Reader Service Card.**



Temperature Probe solid state device

TEXAS INSTRUMENTS INC., P.O. Box 312, Dallas, Texas. Featuring a positive temperature coefficient that results in a constant rate of change on the order of 0.7 percent per deg C along a retraceable curve, the new Sensistor temperature probe is encased in a glass package only 0.078 in. in diameter and 0.500 in. in length. It can indicate quickly and accurately temperature changes by measuring the resistance in a mass and recording this resistance as a temperature indication. It is ideal for telemetering, liquid fuel temperature measurement, and other such applications. **Circle 56 on Reader Service Card.**

Digital VOM transistorized

EPSCO, INC., 588 Commonwealth Ave., Boston 15, Mass. A new compact, lightweight transistorized digital volt-ohm meter accurately measures both resistance and voltages. Features are: no moving parts, bright, in-line, in-plane, visual display, four switchable bipolar voltage ranges, four switchable resistance ranges, automatic polarity indication, automatic decimal point indication, less than 10 millisecond reading time. The DVOM can directly drive printers, punches and memory storage units. An engineering data sheet is available. **Circle 57 on Reader Service Card.**

Power Oscillator supplies 160 va

THE INDUSTRIAL TEST EQUIPMENT CO., 55 E. 11 St., New York 3, N. Y. The new model 150 power oscillator supplies 160 va of power at either a fixed frequency of 400 cps ±0.25 percent or a variable

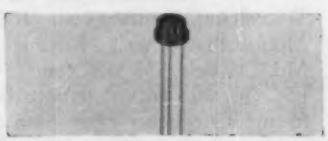
frequency with a range of 350-450 cps. An input jack is also provided for output frequencies from 50-4,000 cps. Output voltage is continuously variable from 0-120 v. Special features include: less than 1 percent output distortion, better than 1 percent regulation from no load to full load, and the ability to be used with loads of any power factor. **Circle 58 on Reader Service Card.**

Silicon Rectifier low current

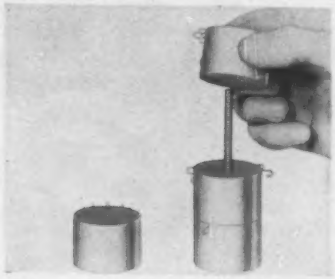
SARKES TARZIAN, INC., 415 College Ave., Bloomington, Ind. The H series hermetically sealed silicon rectifier features a welded case and extra heavy duty junction for high reliability. Ratings range from 100 to 600 piv and 750 ma to 55 C. Data sheets are available. **Circle 59 on Reader Service Card.**

Silicon Transistor low level input

TRANSITRON ELECTRONIC CORP., Wakefield, Mass. Recommended for operation in the range 2-200 μa, the ST1026 silicon transistor features drift of only 0.05 millimicroamperes per deg C and 0.5 millimicroamperes per day. This very low drift makes the transistor use-



ful in circuits with high impedance sources . . . phototubes, G-M tubes, infrared tubes and ionization gages. In addition, many new low current applications are opened up by the high beta (typically 25 at 5 μa to 70 at 100 μa), and the very low I_{co}. **Circle 60 on Reader Service Card.**



Power Transformer small, light-weight

ARNOLD MAGNETICS CORP., 4613 W. Jefferson Blvd., Los Angeles 16, Calif., announces a small, light-weight 20-w toroidal transformer designed for stacking, or printed circuit boards. Standard units, each with a primary of 115 v, 400 cps, are available for filament use . . . for synchro drive, isolation, and plate voltage. Any output can be supplied from 0 to 1,000 v. Up to 3 secondaries are provided, with taps as required. Size of the transformers is only 1⅝ in. o-d by 1⅛ in. high; weight is 3.9 oz. Temperature range is from −55 C to +100 C. Units are encapsulated to meet MIL-E-5272A or MIL-T-27A. **Circle 61 on Reader Service Card.**

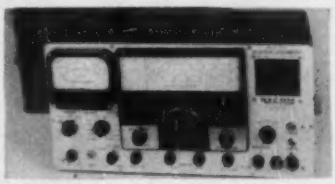
Mica Spacers for tiny tubes

FORD RADIO & MICA CORP., 536 63rd St., Brooklyn 20, N. Y. Insulating-aligning disks of natural mica, less than one-quarter the size of shirt buttons, boost performance and resistance to damage

of electron tubes used in critical missile and communication equipment. The mica pieces are production stamped to 0.001 in. tolerances. Each mica insulator, punched from 0.008 in. natural muscovite sheet boasts a maximum length of 0.300 in., yet contains seven accurately spaced grid and plate alignment holes. **Circle 62 on Reader Service Card.**

Selective Voltmeter wave analyzer

RYCOM INSTRUMENTS, a division of Railway Communications Inc., 9351 E. 59th St., Raytown, Mo. Model 2174 frequency selective voltmeter, with extended frequency coverage from 1 to 400 kc, is a highly selective measuring instrument for fast accurate amplitude measurements. The instrument utilizes the heterodyne principle with balanced modulation and highly selective crystal filter which achieve the high resolution needed for measurements of telemetering subcarrier, microwave subcarrier and carrier telephone channeling equipment. It features a direct reading meter which is calibrated for db or rms voltages, from −90 dbm to



+32 dbm with accuracy of ±0.5 db over the tunable range of 1 to 400 kc. **Circle 63 on Reader Service Card.**

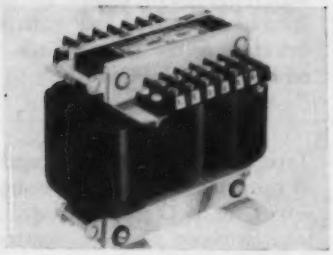
Audio Amplifier transistorized

FERROTRAN ELECTRONICS CO., 693 Broadway, New York 12, N. Y. The Audiotran is a tiny transistorized audio amplifier which can plug into a standard 7-pin socket. It is ideal for use in military receivers since it can be matched to the output of a detector. Units with high input impedances for p-a systems are available. The Audiotran is available as a stock item with power outputs from 120 mw to 2.0 w. **Circle 64 on Reader Service Card.**

Coax Terminations 50 ohm type

WEINSCHEL ENGINEERING, 10503 Metropolitan Ave., Kensington, Md. Models 535-MSC and 535-FSC 50 ohm coaxial terminations feature a frequency range from d-c

to 10 kmc with SC male and female connectors. D-c resistance is accurate to 0.25 percent. Vswr at 400 and 1,000 mc is accurate to 2 percent; at 2 kmc and 4 kmc, accurate to 3 percent; at 7.5 kmc and 10 kmc, accurate to 5 percent. **Circle 65 on Reader Service Card.**



Control Reactors job-rated

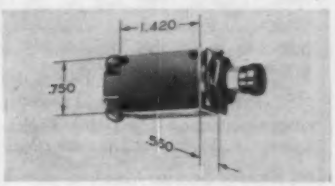
CHICAGO MAGNETIC CONTROL, 1616 N. Damen Ave., Chicago 47, Ill., announces a new line of "job-rated" control reactors for magnetic amplifiers. Forty-eight standard units cover 15 to 450 w. Four series cover sensitivity range from 1.5 to 3 amperturns. 117 v and 240 v are both standard. The Military series meet all MIL-T-27-81 specs, stand 2000 g shock tests. Four standard windings are provided or, the company states, units can be delivered with any number of windings up to eight to specifications. **Circle 66 on Reader Service Card.**

Phototube 14-stage type

RADIO CORP. OF AMERICA, Harrison, N. J., announces the model 7264, a 14-stage, head-on type of multiplier phototube. It is designed for use in scintillation counters for the detection and measurement of nuclear radiation and in applications involving the measurement of low-level light sources. It is relatively free from after-pulses. Spectral response covers the range from about 3,000 to 6,500 angstroms. Maximum response occurs in the blue region at approximately 4,400 angstroms. When operated at a supply voltage of 2,000 v, the model 7264 has a median luminous sensitivity of 875 amperes per lumen and a current amplification of 12,500,000. **Circle 67 on Reader Service Card.**

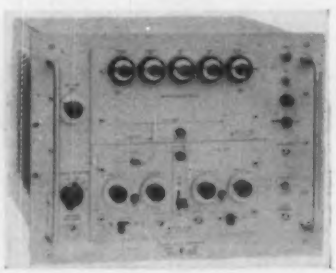
Circuit Breaker microminiature

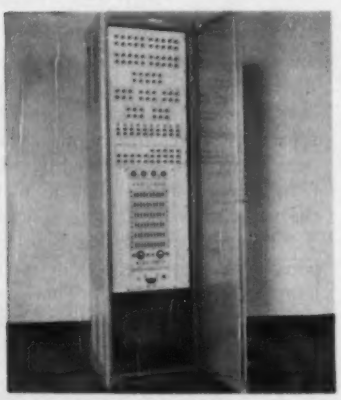
METALS & CONTROLS CORP., Attleboro, Mass., announces the Klixon 7274-1, a very small, low amperage (½ to 5 ampere ratings) circuit breaker. A thermal breaker of the manual reset type, the new model is designed for the aircraft, radio and electronic equipment industries in accordance with Specification MIL-C-5809C (ASG). **Circle 68 on Reader Service Card.**



Delay Generator two time intervals

HEWLETT-PACKARD CO., 275 Page Mill Road, Palo Alto, Calif. Model 218A digital delay generator produces two accurately controlled time intervals. It is a direct slave to any beginning or synchronizing pulse, even though random. It is useful in calibrating timing circuits such as found in radar systems, oscilloscopes and marker generators; in timing responses from drum storage systems of computers, and in the precision pcm of control carriers. Range of delay times is digitally adjustable in 1-μsec steps from 1 to 10,000 μsec with provision for continuous interpolation between the 1 μsec steps. **Circle 69 on Reader Service Card.**





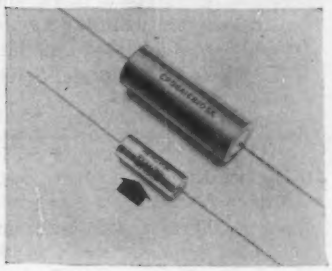
Timer-Programmer transistorized

NAVIGATION COMPUTER CORP., 1621 Snyder Ave., Philadelphia 45, Pa. A fully-transistorized timing device covers the range from zero to 100 sec in one millisecond increments. A total of 10 independent functions may be controlled and selected from convenient decade selector switches on the front panel. The timing cycle may be initiated manually or from an external start pulse. Applications may be found wherever accurate timing of sequential operations is required, such as jet or rocket engine testing, missile check-out procedures, and in industrial processing. **Circle 70 on Reader Service Card.**

H-V Power Supply for spectrometry

TRACERLAB INC., 1601 Trapelo Road, Waltham 54, Mass. The SC-64 h-v power supply exhibits a high degree of stability which is more than adequate for all

spectrometry requirements. Range of the unit is from 500 to 2,000 v and two front panel controls permit selection of any voltage between 500 and 2,000 v. An 0-2 kv meter indicates at a glance the voltage being supplied. Because output voltage may be positive or negative with respect to the chassis, the unit is compatible with all radiation detectors in use today. **Circle 71 on Reader Service Card.**



Capacitors metallized-paper

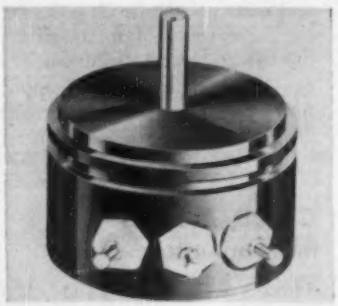
AEROVOX CORP., New Bedford, Mass., is producing 50 v d-c metallized-paper capacitors specifically designed for transistor applications. The units (indicated by arrow) are constructed in metal tubular case styles with glass terminal seals. Type P1232NNG units are capable of operation at temperatures from −65 C to 85 C at full voltage rating. Extended electrode construction with soldered connections at all electrical contacts, plus the Aerovox NN solid impregnant, enables these capacitors to be used at all voltages up to rated voltage. **Circle 72 on Reader Service Card.**

Miniature Fans for cooling gear

ROTRON MFG. CO., Schoonmaker Lane, Woodstock, N. Y. The Aximax-3 fan delivers 165 cfm free delivery when turning at 20,000 rpm. Fan is only 2.8 in. in diameter, 2.3 in. deep and weighs but 14 oz. Applicable Air Force Specifications are met. Fan is available for operation on 115 v a-c, single phase or 220 v a-c, 3 phase, 400 cps power supply. **Circle 73 on Reader Service Card.**

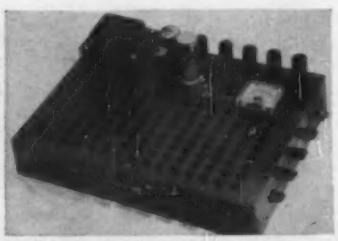
Precision Pot for rugged service

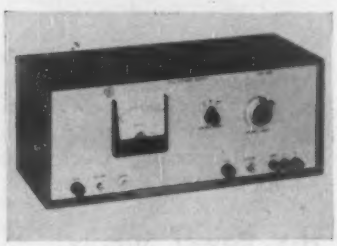
HELIPOT DIVISION of Beckman Instruments, Inc., Fullerton, Calif., Series 5200 is an all-metal, single-turn, servo-mounting precision pot, 1⅞ in. in diameter offering a standard resistance range of 250 to 100,000 ohms. It withstands 2,000 cps at 30 G's; 10 cycles NAS 710 procedure III humidity; 50 G's shock and 100 G's acceleration. NAS 710 requirements for salt spray, fungus resistance, sand and dust, and altitude are also met or exceeded. **Circle 74 on Reader Service Card.**



Analog Computer miniature unit

EBE, INC., 1015 Atkin Ave., Salt Lake City 6, Utah, announces Micrologg, the miniature analog computer. By plugging in cords of feedback units and input units the computer can be made to: add, subtract, multiply, divide, differentiate, integrate and do other mathematical operations. All parts are included and assembled before shipment. A separate metering unit is provided to give visual indication of the answers. Price is $89.50 plus postage. **Circle 75 on Reader Service Card.**





D-C Power Supply for lab or field

OWEN LABORATORIES, INC., 55 Beacon Place, Pasadena, Calif. With regulation within 0.002 percent, the type 500-3 (continuously variable) and the type 505-3 (4 decade step control) units supply 0-100 v. They are designed for energizing strain gages and other transducers where exceptionally high stability and voltage or current regulation are required; for electronic circuitry (vacuum tube and transistor) where fast transient response is necessary for proper operation, and for applications where a variable, but ultra stable voltage is required, as in analog computation. **Circle 76 on Reader Service Card.**

Ceramic Capacitor stable device

SPRAGUE ELECTRIC CO., 35 Marshall St., North Adams, Mass. The new C40 minified stable ceramic capacitors have three times the capacitance on a given disk size than was previously possible with the so-called Stabl-K formulations. Yet they will change less than 2½ percent in capacitance from room temperature to +85C. They are available with voltage ratings of 250, 500 and 1,000 v. Data are available on letterhead request.

Literature of the Week

MATERIALS

Raw Materials. Shieldalloy Corp., a division of Metallurg Inc., Newfield, N. J., has available a product listing of rare metals, metal oxides and alloys, and a price listing of boron and boride alloy powder products. **Circle 80 on Reader Service Card.**

COMPONENTS

Autotransformer. General Radio Co., 275 Massachusetts Ave., Cambridge 39, Mass. Included in a recent issue of *The Experimenter* is an illustrated description of the type W20, a new 20-ampere Variac autotransformer. **Circle 81 on Reader Service Card.**

Basic Switches. Micro Switch, Freeport, Ill., has published an enlarged 32-page edition of its basic switch catalog (number 62e). Significant innovations in basic switches for industrial and commercial applications have been added. **Circle 82 on Reader Service Card.**

Bimetal Strip Thermostats. Stevens Mfg. Co., Inc., P. O. Box 1007, Mansfield, Ohio. Bulletin 7000 describes the operating principles of the type R bimetal strip thermostats which provide quick, positive, make and break of an electrical circuit at a predetermined temperature. **Circle 83 on Reader Service Card.**

Capacitor Reliability. Electro Motive Mfg. Co., Inc., Willimantic, Conn. A new six-page folder describes how "debugging" insures long life and rugged reliability in El-Menco Dur-Mica capacitors. **Circle 84 on Reader Service Card.**

D-C Power Packs. Beta Electric, division of Sorensen & Co., Inc., 333 E. 103 St., New York 29, N. Y. A loose-leaf perforated sheet covers the series 9000 Hi-Sel D-C Power packs which feature air insulation, resulting in minimum weight; and selenium rectifiers with trouble-free life in excess of 10,000 hours. **Circle 85 on Reader Service Card.**

Coils. Stonite Coil Corp., U. S. Highway 130, Yardville, N. J. Bulletin S-20 is an 8-page illustrated description of the company's facilities for manufacturing vacuum impregnated coils. **Circle 86 on Reader Service Card.**

High-Speed Transistors. Sprague Electric Co., North Adams, Mass., has published an engineering data sheet covering the type 2N-393 high-speed, high-gain germanium Micro-Alloy transistors. It is available on letterhead request.

EQUIPMENT

Digital Volt-Ohmmeters. Non-Linear Systems Inc., Del Mar Airport, Del Mar, Calif. A four-page bulletin covers the series 20 transistorized mercury relay digital volt-ohmmeters for missile check-out systems. Specifications and applications are included. **Circle 87 on Reader Service Card.**

Portable Calibration Standard. Taylor Instrument Companies, 95 Ames St., Rochester 1, N. Y. A four-page bulletin illustrates and describes a portable test set for checking and calibrating amplifiers and process controllers. **Circle 88 on Reader Service Card.**

Test Equipment. The Narda Microwave Corp., 118-160 Herricks Road, Mineola, N. Y., has published its 1959 84-page microwave and uhf electronic test equipment catalog. **Circle 89 on Reader Service Card.**

FACILITIES

High Alumina Ceramics. Coors Porcelain Co., 600 Ninth St., Golden, Colo., has issued a new short form bulletin giving production facilities and mechanical and electrical properties of its high alumina ceramics. **Circle 90 on Reader Service Card.**

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Form New Corporation

ANNOUNCEMENT was recently made of the formation of Alpine Electronic Components Corp. Firm is housed in a new 12,000 sq ft building on Wolcott Road in Waterbury, Conn.

The company is engaged in the manufacture of electronic components and parts, including solder terminals, insulated standoff terminals and feed-throughs and chassis hardware.

Thomas E. Rowlison, president, said that the company's lines will be complete and that industry-accepted sizes and types of components will be carried in stock.

In addition, several new products are ready for announcement, including "Leed-savrs", a new terminal which allows pigtail leads to be removed with a minimum of heat.

Already in production are a new lightweight tubular handle for airborne electronic equipment and a complete line of terminals for encapsulated assemblies.

Richard H. Sceery is serving as vice president of sales, with John Iorio treasurer and Joseph Pagano secretary. All are experienced in the electronics and electrical industries, with special emphasis on screw machine products and electronic components.

Humphrey Adds Directors

IN SAN DIEGO, Calif., Humphrey, Inc., manufacturer of precision electronic and electrochemical equipment, has added two new members to its board of directors. The appointments give Hoffman Electronics Corp., Los Angeles, representation on the board.

In April, the two firms concluded an agreement whereby Hoffman acquired a 30-percent interest in Humphrey, Inc. Under terms of the agreement, Hoffman was licensed to manufacture Humphrey products, thereby establishing two sources of supply for the company's precision electromechanical equipment.

The two new appointments increased total membership on the board to five. New members are C. E. Underwood, vice president-treasurer, Hoffman Electronics Corp., and Lawrence Mendelsohn, vice president of Hoffman Laboratories, Inc., a Hoffman subsidiary. Other members are Paul E. Humphrey (chairman), Robert Ackley, and R. T. Rutherford, all of Humphrey, Inc.

Appoint Clark at Super-Temp

AMERICAN Super-Temperature Wires, Inc., of Winooski, Vt., has appointed Frank Clark as project engineer for the cable division.

Clark was formerly chief inspector for the Continental Wire Co., and prior to that, production control engineer with GE in Bridgeport.

In his new capacity he will have engineering responsibility for the development and production of new cable designs and will be available for consultation concerning high temperature cabling problems.

SRI Combines Research Units

Two radio systems laboratory research groups at Stanford Research Institute have been combined and renamed the Communications and Radio Propagation Group.

Allen M. Peterson (picture) heads the new group. His assistants are Ray L. Leadabrand and Wilbur R. Vincent who direct research in propagation and communication systems, respectively.

Packard-Bell Expands

ADDITION of 20,000 sq ft of leased space in West Los Angeles to its expanding Technical Products Division was recently announced by Packard-Bell Electronics Corp.

The new facility will house engineering and administrative personnel of the Missile Equipment Section and the engineering staff of the Packard-Bell Computer Corp.

Increased activity in missile work necessitated the third expansion of the Missile Equipment Section in the last nine months. Packard-Bell currently is manufacturing prelaunch and check-out equipment

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Cryogenics research is typical of the several advanced electronic projects for which assignments are available at IBM Kingston. Studies in the behavior of materials at extremely low temperatures are leading to radical new weapon control memory systems. Fundamental work is also being conducted in cryogenic switching devices and the metallurgy of super-conducting materials. Engineers and scientists who enjoy the challenge of fresh inquiries will find IBM Kingston a stimulating environment.

A CAREER WITH IBM. A recognized leader in the electronic computer field, IBM presents unusual opportunities for technical achievement and professional advancement. With a secure position in commercial sales, IBM offers stability, liberal company benefits, company-paid relocation expenses and advancement on merit. Salaries are commensurate with ability and experience.

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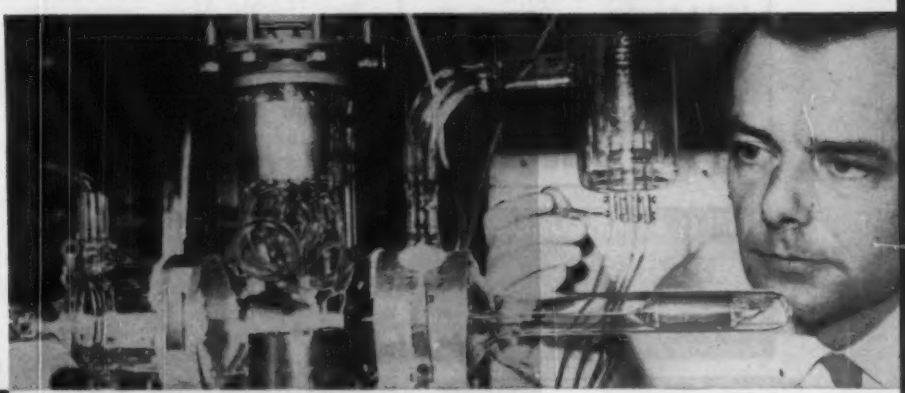

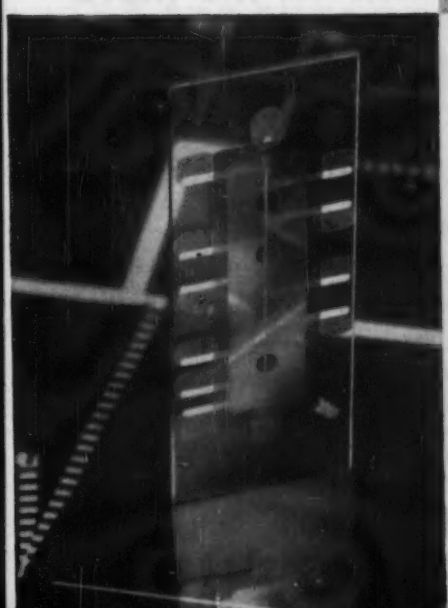

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for the Thor intermediate range ballistic missile and is active in other classified projects.

Philco Forms AWS Group

A NEW advanced weapon systems (AWS) group was recently formed by Philco Corporation's Government and Industrial Division.

Hayden N. Ringer is promoted to manager of the new group. He had been in charge of the G and I Division's missile fuze research, development and production engineering for the Terrier, Talos, Tartar, Sergeant, Corporal, Little John and Falcon missiles.

News of Reps

Two new sales reps have been appointed by Electralab, Inc., Needham Heights, Mass., printed circuit manufacturers. **The D. G. Quinlan Co.** will serve the company in eastern Pennsylvania, southern New Jersey, Delaware, Maryland and the Washington, D. C. area. **The Hippler Sales Co.** will cover Missouri.

The Clyde H. Schryver Sales Co. is appointed to represent American Microphone Mfg. Co., Milwaukee, Wisc., in Iowa and Nebraska.

Computer Engineering Associates, Inc., Pasadena, Calif., appoints **Engineering Associates, Inc.,** as reps for Texas, Oklahoma, Arkansas and Louisiana.

Hi-Spec Electronics Corp., North Hollywood, Calif., will be represented in northern California and northern Nevada, by the **James S. Heaton Co.**

The Communication Accessories Co., Lee's Summit, Mo., a division of Collins Radio Co., announces appointment of **Edward G. Schmeichel** as its rep for metropolitan Chicago, Milwaukee, and in Michigan, north to Grand Rapids.

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½ the size of previous types . . . yet they perform better!

New Bomac crystal protectors are the smallest available. They pack a maximum of performance into a minimum of space. They're half the overall length of the usual broadband TR tube, but with electrical characteristics that are equal *or better*. There's a complete line, for all the above bands — and every single one is 100% tested and life-tested with crystals mounted in position. Complete information is waiting for you. *Write today.*

PERFORMANCE DATA

BANDS — L S C X X_b K_u K K_a

TYPICAL X-BAND RATINGS:

Power — 10 kw peak

Insertion Loss — 0.7 db including ignitor interaction

Recovery Time — 1.5 μ sec.

VSWR — 8565-9487 > 1.3
8490-9578 > 1.6

Dimensions — approx. ¾" between flange faces

Life — 500 hours

End of life recovery time — 5.0 μ sec.

Bomac LABORATORIES, INC.
Salem Road, Beverly, Massachusetts

Leaders in the design, development and manufacture of TR, ATR, Pre-TR tubes; shutters; reference cavities; hydrogen thyratrons; silicon diodes; magnetrons; klystrons; duplexers; pressurizing windows; noise source tubes; high frequency triode oscillators; surge protectors.

Offices in major cities—Chicago • Kansas City • Los Angeles • Dallas • Dayton • Washington • Seattle • San Francisco • **Canada:** R-O-R Associates Limited, 1470 Don Mills Road, Don Mills, Ontario • **Export:** Maurice I. Parisier, 741-745 Washington St., N.Y.C. 14, N.Y.

90 Watts CW Input (ICAS) up to 60 Mc
60 Watts CW Input (ICAS) at 175 Mc

The beam power tube that takes the

"SHOCKS 'N SHAKES"

New, rugged RCA-7212 Beam Power Tube is an outstanding performer in equipment subjected to severe vibration and shock

Completely new from the ground up—yet electrically equivalent to the well-known RCA-6146—the RCA-7212 is the answer for equipment designers who require a small and husky beam power tube that can STAND UP in almost any "rough and tumble" communication or industrial application.

Is Tube Shock your Problem? RCA-7212 is designed to withstand an impact acceleration of 500 g in four different positions (per MIL-E-1C*, par. 4.9.20.5).

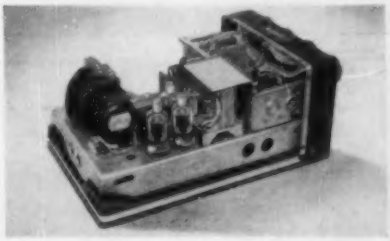
Is Tube Fatigue your Problem? RCA-7212 is designed to withstand vibrational acceleration of 2.5 g at 25 cps for 32 hours—in each of three positions (per MIL-E-1C*, par. 4.9.20.6).

Is Tube Vibration your Problem? RCA-7212 is designed to withstand low-frequency vibration of 25 cps with a fixed amplitude of 0.040 inch (per MIL-E-1C*, par. 4.9.19.1)—variable-frequency vibration at the same fixed amplitude in each of three positions through the frequency range from 10 to 50 cps and back to 10 cps (per MIL-E-1C*, par. 4.9.20.3)—and variable-frequency vibration in each of three positions through the frequency range from 50 to 120 cps at a fixed acceleration of 10 g.

If you are designing equipment for service under conditions involving severe mechanical shock and vibration, solve your problem with the RCA-7212. For long-term operating reliability and economy, nothing beats it in its class. RCA-7212 takes 90 watts CW input up to 60 Mc, and 60 watts CW input at 175 Mc (ICAS). Plate dissipation is 25 watts maximum (ICAS).

Ask for a technical bulletin on the RCA-7212 from RCA Commercial Engineering, Section J19Q-5, Harrison, N. J.

*Military Specification, Electron Tubes and Crystal Rectifiers 3 October 1955.



RCA-7212's are used in the closed-loop TV link of one of the most advanced airborne fire-control systems.

Where to get help and information

INDUSTRIAL TUBE PRODUCTS SALES
744 Broad Street, Newark 2, N. J. HUmboldt 5-3900
Suite 1154, Merchandise Mart Plaza
Chicago 54, Illinois. WHitehall 4-2900
6355 E. Washington Blvd.
Los Angeles 22, Calif. RAymond 3-8361

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1625 "K" St., N. W. Washington 6, D. C. District 7-1260

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